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BRITISH GAS COUNCIL

THE issue of a formal invitation to members of the National Gas Council and the British Commercial Gas Association to transfer their membership from those organizations to the incorporated British Gas Council indicates the approach of the completion of the arrangements—beset with many difficulties over the past two years—whereby, in place of the two former bodies, which will be wound up, one organization formally constituted to represent the Gas Industry, with the manifold advantages which arise therefrom, will be established. The company and municipal members of the organizations whose functions, assets, and liabilities are now to be legally taken over, supply 99% of the gas distributed in the United Kingdom. The British Gas Council was set up by agreement in March, 1945, to conduct and co-ordinate the work of the two organizations, and the work has been progressively merged.

The aim was to constitute a single national body through which the Gas Industry could deal effectively with the varied problems of the present and future, particularly those arising from the proposed nationalization of the Industry. To facilitate the conduct of its business the British Gas Council was incorporated on November 1 as a company limited by guarantee, without share capital, and with the licence of the Board of Trade to omit the word "limited" from its title. The Memorandum and Articles of Association afford a constitution and prescribe subscriptions similar to those of the two original organizations, for the winding up of which and the taking over by the British Gas Council of their assets and liabilities provision is made.

The rights and obligations of member undertakings of the incorporated British Gas Council remain substantially the same as, although more precisely defined than, those of the members of the National Gas Council and the B.C.G.A., except that the liability of member undertakings in the event of winding up is limited to an amount not exceeding £1. The objects and eligibility for membership are similar to those at present obtaining, but the subscription will be calculated on gas sold instead of gas made, and all undertakings will pay at the same rate. Each member undertaking has one vote in general meeting. The Central Board, the governing body of the Council, will comprise members elected by the Districts, into which the United Kingdom will be divided. Each District will have a District Board, to which each member undertaking in the District may appoint two members. The Central Board and the District Boards may delegate powers to committees. The Memorandum and Articles of Association will be extended by regulations prescribed by member undertakings in general meeting and by by-laws made by the Central Board. In the meantime the Council will continue to function under the present Central and District organization, while the Central Board and Executive, Central, and District Committees will remain unaltered.

The financial year of the British Gas Council, as well as of the two original organizations, ends on March 31, and the member undertakings have been invited to complete the transference of their membership before that date.

RESEARCH PROGRESS

IN a recent issue of the "JOURNAL" we gave prominence to the Presidential Address of Dr. Harold Hartley on the occasion of the Silver Jubilee of the British Cast Iron Research Association. We featured this Address for more than one reason, chiefly, however, because it has in fact considerable bearing on the work and planning for the Gas Research Board. In 1942, the British Cast Iron Research Association acquired very fine premises when they had an income of only £25,000 a year. They showed much enterprise and the premises which they acquired near Birmingham, Bordesley Hall, with 15 acres of land for subsequent development, cost £10,000. This acquisition not only lent prestige to the Association but gave great incentive to the staff employed, and this incentive has borne fruit. We mention in particular the work of Mr. Morrogh and his team, as a result of which means have been found of producing iron in the "as cast" condition with the graphite in nodular or spherical form instead of as the elongated flakes, found normally. The effects on the properties of the castings are, to say the least, striking, and they were set out in Dr. Hartley's Presidential Address. We will not detail them at any length here, but it is astonishing, to take a single example, to realize that the tensile strength, transverse strength, and shock resistance are doubled or trebled. The "as cast" material has the properties of the best types of high duty cast iron and is obtained without the use of special compositions or the treatments necessary hitherto. Now this process has been evolved as a consequence of fundamental or background research carried out by the Association over a number of years. It is a logical development; it is not haphazard.

We feel that there are several gas engineers who are not appreciative of the importance of what we have termed background work, but regard only *ad hoc* research as of the worthwhile type. And yet it is only by doing fundamental

work that great progress can result. The fruition of the research on cast iron which we have mentioned must give great pleasure to Dr. Hartley who, as we have mentioned, is now President of the Association and has for seven or eight years acted as Chairman of Council. We think it is well that engineers in the Gas Industry should realize that the interests of plant and appliance manufacturers, by the nature of their work, extend well beyond the field of carbonization and gaseous combustion.

We turn to the work and progress of the Refractory Materials Joint Committee of the Gas Research Board and the British Refractories Research Association. The grant-earning income of the British Refractories Research Association has increased from £6,000 last year to £13,000, and this income has been augmented by the Department of Scientific and Industrial Research by £12,600. The Gas Research Board has contributed £2,000 and the iron and steel industry the same amount. The pottery industry has contributed £1,000 and the British Coal Utilization Research Association £500. Gas undertakings have done a small share to the extent of £1,000. Yet, as Mr. T. F. E. Rhead recently pointed out, £100,000 a year is needed. Without question, the British Refractories Research Association is, in common with the British Cast Iron Research Association, looking ahead and appreciating not only its responsibilities but its possibilities.

CONSUMER SERVICE

MUCH has been written on the subject of consumer service and, in fact, few other subjects can have occasioned so much repetition. When a Paper on this problem is to be given, it is not difficult, therefore, to foretell much that it will contain. Although to one having no knowledge of the matter such repetition would seem unnecessary, our sympathies lie with the authors—for a number of reasons. Most important is the fact that if good advice is given and wholly or partially ignored, the genuinely well-meaning adviser has no alternative but to repeat his advice at a later date. Also, the audience to which the advice is given will almost certainly be changing, albeit gradually, and a greater degree of change exists in the general circumstances of to-day. Conditions have changed drastically through the war years, and although methods of service are fast returning to normal, the results of that period of enforced negligence—an ugly phrase, but a true one—are still with us and likely to be for some time. It was, therefore, with confidence of meeting familiar words and advice, and hope of encountering new and topical variations on an old theme, that we studied the Paper given to the London and Southern District Junior Gas Association, by Mr. J. A. Marwick, entitled "Consumer Service: Deeds, not Words."

The subject of consumer service is a difficult one because one must decide where to draw the line. Perfection in this world is, unfortunately, an impossibility and were it not so, we doubt whether the consumer would appreciate his good fortune. The service must be economically practicable, and for its success must be concerned with appliances whose design is such that efficient running is possible, and the service must be backed by adequate pressure and quality of gas—factors outside the range of the servicing department. It may be argued that economy in servicing is wasteful, and that infrequent visits result in increased complaints. There is much significance in this, for not only may the expense of sending men on separate journeys in answer to complaints prove more expensive to the undertaking, but it will result in a loss of prestige. It is generally recognized that a general house inspection should be carried out once a year, but the period between servicing such appliances as fires and instantaneous water heaters has been much discussed. Mr. Marwick plays safe and advocates an interval of three or four months for water heaters and advises that fires be serviced before and after the winter months. The yearly inspection applies primarily to cookers, but even this has been disputed, it being maintained that once a year is too frequent when the appliance is new, and not frequent enough when it has done long service. Mr. Marwick rightly draws attention to one drawback of this yearly inspection method—namely, that the census is up to date only once during the year and the consumer has a variety of employees calling during the course of the year.

This assumes that specialized men are employed for servicing particular appliances and, although this is probably true of most undertakings, there are many which prefer a fully qualified maintenance fitter capable of servicing any domestic appliance. Much depends on the size of the undertaking and the number of similar appliances installed in its area, although we feel the amount of "walking time" incurred and the lack of training of maintenance men in dealing with appliances other than that in which they specialize is open to criticism.

It is strange that Mr. Marwick, having acknowledged the value of the all-round maintenance man, should remark that this "involves increasing the status of the maintenance men so that they are little less important than the installation fitters." In remuneration their position may in most cases be subservient to the installation fitters, but to be all they should be—that is, to be capable of servicing any appliance efficiently—it is surely wrong to regard them as inferior to their installation colleagues. It is one thing to install a new instantaneous water heater with new materials; it is another to repair it after age and misuse have left their mark.

Mr. Marwick makes no mention of foremen; can it be that this body of men have been so quietly efficient about their daily task that they have escaped notice entirely? It is open to doubt whether it is good for a man to be so occupied that he makes no sign of his presence. Is it true that many foremen who have held that position for years are not completely *au fait* with modern appliances and installation practice? We suggest that if some simple form of examination was carried out, the results would be surprising. The blame does not lie with the men in question, but rather with the undertakings which should have taken the trouble to educate their employees sufficiently to comply with present-day needs. To have a state of affairs wherein the student's knowledge surpasses that of the master is hardly conducive to progress. The importance of the foreman cannot be overestimated; he is a link between the men, with whom he must be able to associate with ease, inspiring friendliness and confidence, and his superiors, to whom he must be able to give accurate and detailed information, foresee shortages and difficulties of all kinds, and make constructive suggestions. Some undertakings are not educating and getting the best out of their foremen.

If the question of foremen could be regarded as an omission from the Paper, Mr. Marwick is provocative when he advocates service on a twenty-four hour basis. Gas escape normally receives complete priority and is counteracted within the shortest possible space of time. The less urgent report of "no gas," caused possibly by the jamming of the prepayment meter by the use of bent coins must, in Mr. Marwick's opinion, be dealt with equally swiftly. Where the area is relatively large, and the number of complaints received outside normal working hours is relatively great, "then some system whereby fitters are on shift work duty, working in a workshop base and ready for any emergency, merits careful consideration. By such a means the men are available for any sudden emergency, and if they are provided with motor transport, then the stage is being reached when real service is becoming a reality." We feel the problem of providing work which the fitter could regard as stand-by duty will prove a headache to many undertakings. Never-

theless, there are certain jobs, such as the descaling and servicing of café boilers, which can well be carried out at night, which might provide an opportunity for supplying the type of service desired. In aiming high, Mr. Marwick is to be congratulated, for the ideas he puts forward promote discussion and eventually bring in their wake a forward movement in consumer service. His Paper will be published in full in a forthcoming issue of "GAS."

INCENTIVE

ADVICE to the effect that one must start educating young people to appreciate the value of gas as a fuel and the work being performed by the Industry for the betterment of the citizen has long been repeated with regularity. A certain amount has been and is being done to this end, but hitherto the move, we think, came from those gas undertakings which have sent lecturers to schools and young people's clubs and have arranged for parties to visit gas-works. The purpose of this is two-fold: (i) to plant the idea that the use of gas is progressive and is conducive to efficiency in home and in industry and (ii) to foster interest in gas manufacture and utilization and thereby to stimulate a supply of prospective employees. In the areas where such methods have been practised, results have shown their adoption to be a worthwhile investment but, valuable as these activities undoubtedly are, there has been a great need for instruction on gas and the Gas Industry from other sources.

It is therefore with pleasure that we learn of the example of direct instruction on these matters by a school acting on its own initiative. The school in question is the Cottesmore Secondary School at Nottingham, where boys in the third and fourth forms are taught elementary mechanics and chemistry, which are developed to form a basis for a simplified course in gas manufacture, and an account of their progress will be found in this issue.

It need hardly be stressed that the Gas Industry offers admirable scope for a progressive course of this kind, which can be lightened and made interesting by models, films, demonstrations, visits, and visiting lecturers. Moreover, the interest evoked in the operation of the Industry will not be confined to those schoolboys taking the subject as part of their normal syllabus; it will spread to parents who demand an account of their offsprings' doings in and out of school and who will no doubt be the recipients of eulogistic accounts of wisdom acquired and wonders seen. The results of such instruction are not limited; may be in time to come the child will be able to enlighten the parent in the service to be obtained from gas usage and the factors which make that service desirable. Nor do we envisage the "precocious" child. The social side of the picture has not been neglected; the civic significance of the Gas Industry has been explained and has been seen in action. The large number of adults living in ignorance of the workings of the public services at their disposal bears witness not only to the insufficiency of instruction granted them in the past, but also to what foreigners have labelled "the British vegetativeness."

Here surely is a start, and a promising one, towards the awareness so necessary for the citizen of to-morrow of the forces harnessed for his use, and towards the greater appreciation of the Industry, its workings, and the opportunities it offers for progressive employment. Great credit is due to the headmaster of the school which forms the basis of this note, Mr. C. W. Leaning, and his colleagues for their awareness of current needs, and also to the officials of the Corporation Gas-Works at Basford for their collaboration. Bearing in mind George Meredith's assertion that "When the Heavens behold good will in the right direction, they do their best to help it," we feel sure that this example will be emulated by similar schools throughout the country.

The Institution—Birmingham Meeting

A varied and attractive programme is being arranged for the 84th Annual General Meeting of the Institution of Gas Engineers, which will be held in Birmingham on June 3, 4, 5 and 6. This will be the first annual meeting to be held out of London since the Liverpool meeting in 1933, and it is hoped that it will attract a very large attendance. The business sessions, in the morning and afternoon of June 3 and the mornings of June 4 and 5, will be held in the spacious Town Hall and will be opened by a Civic Reception. A Reception and Dance will be held on the evening of June 3 in the University of Birmingham. The Institution is fortunate in being allowed the use of the Great Hall of the University, which provides a fine setting and ample accommodation for an unlimited number of dancers. The authorities are sparing no effort to make this function an outstanding occasion. Visits to works and ladies' visits will take place on the afternoons of June 4 and 5, while June 6 is set aside for a whole-day visit to the Shakespeare country, including Kenilworth, Warwick, and Stratford-on-Avon. Some members may wish to conclude this day by attending a performance at the Shakespeare Memorial Theatre and it is hoped to be able to arrange for a number of tickets to be available for their use. Hotel accommodation in the centre of Birmingham, always limited, is already heavily booked, but there are many good hotels in the suburbs and surrounding district at which accommodation is still obtainable.

Assistance for Students

The Council of the Midland Junior Gas Association is considering ways in which it might be of assistance to students, and as a necessary first step it is seeking the co-operation of members of the Association in compiling a list of those who are taking, or intend to take, a course of study in Gas Engineering or Ancilliary subjects. A circular sent to all the members—so that those to whom it does not apply may be aware of the Association's activities—invites students to return a tear-off slip stating what they are studying, where they are attending classes, and the examination to be taken. A Paper which promises to be of unusual interest to members of medium-sized and smaller undertakings will be given at a meeting of the Association on Feb. 11 by Mr. R. Thompson, Secretary of the Bilston Gas Light and Coke Company, on "The Engineer and the Accountant in the Gas Industry." Another news item from the Association is that the visit to the Coventry Colliery of the National Coal Board at Keresley, which was to have been made by two separate parties on Feb. 2 and 9, will now consist of one party only, on Feb. 16.

F.B.I. Objections to Nationalization

The Federation of British Industries has issued a statement on the proposed nationalization of gas and electricity services, in the course of which it says:

"After full examination, the Federation can see no evidence to suggest that this course will bring any advantage to industrial consumers. The Federation moreover is apprehensive that increases in cost and lower standards of service to the industrial consumer will result from the establishment of vast administrative units of the pattern now becoming apparent. Evidence shows that the two industries, both privately and publicly owned, as at present constituted, are both able and willing to carry through any reorganization that is required.

"A representative committee of consumers has reviewed the question from the point of view of quality of supply, cost, and standard of availability and service offered. Its conclusions are:—

"(1) Judged by the criteria just indicated, past services, with few exceptions, have been satisfactory, and both industries have maintained continuous progress over a long period.

"(2) Both industries have adequate proposals—by way of amalgamations and grouping—to overcome limitations to further progress due to existing structure and legislation.

"(3) Both industries are alive to the need of extensive technical developments, and have both the plans and the funds ready for this purpose.

"For these reasons the Federation reiterates its strong objection to the Government's proposals."

Personal

Mr. J. B. LONGMUIR, M.B.E., who has been appointed Director of Welfare by the National Coal Board, has been General Welfare Officer to the colliery, engineering, and chemicals firm of Newton Chambers & Co., Ltd., Sheffield, since 1942, and was previously Welfare Officer to the Glasgow firm of Mavor & Coulson, Ltd.

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Following the recent death of Mr. M. T. Thompson, Managing Director, the management of Drakes, Ltd., Halifax, has been reconstituted. The new appointments are Mr. J. A. DRAKE, Managing Director; Mr. F. D. DRAKE and Mr. W. F. RAISTRICK, Joint General Managers; Mr. G. HARRISON, Chief Draughtsman (Brickwork); and Mr. P. ROBERTSHAW, Contract Manager.

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Mr. W. J. DRUMMOND, Deputy Chairman of the North Western Divisional Coal Board, has accepted appointment as Hon. Secretary of the British National Committee of the World Power Conference in succession to the late Mr. C. Rodgers, O.B.E. Mr. Drummond has been a member of the British National Committee for many years, and has participated actively in the Committee's work.

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Mr. DONALD HICKS has been appointed Director of Scientific Control of the National Coal Board under Sir Charles Ellis, F.R.S., Scientific Member of the Board. Mr. Hicks has served with the Department of Scientific and Industrial Research since 1924, being appointed superintendent of the coal survey last October. His new duties cover the control and supervision of the scientific organization which is being established by the National Coal Board in each division.

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Mr. D. D. BURNS, appointed on Jan. 24 as General Manager of the Glasgow Gas Department, in succession to Mr. JOHN W. MCCLUSKY, is a well-known figure in Scottish athletic circles. Some 20 years ago he was an outstanding sprinter with the West of Scotland Harriers, and since then he had been connected with the official side of amateur athletics. He is a Past President of West of Scotland Harriers Club, and held office as President of the Scottish Amateur Athletic Association in 1938-39. Before his appointment as General Manager, Mr. Burns was Commercial Secretary of the Department.

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Following the annual meeting of the Conjoint Conference of Public Utility Associations on Jan. 22, a pleasant ceremony took place at Grosvenor House. Lieutenant-Colonel SHOLTO S. OGILVIE, D.S.O., who recently retired after 23 years as Joint Hon. Secretary, was presented with a portrait of himself by Frank Salisbury—the first work executed by this distinguished painter since his return from America, where President Truman sat for him. Colonel Ogilvie was educated at Rugby and Oxford, where he obtained a First in Classics. Called to the Bar, he practised in the Chambers of Lord Hailsham until he joined the Wiltshire Regiment in 1914. He was awarded the D.S.O. and two bars. In 1919 he became Joint Manager of the National Gas Council (now merged in the British Gas Council). He retired in 1946.

Obituary

The death has occurred of Mr. F. GREENROYD, of Bolton-le-Sands, aged 83, who for many years was Manager of the gas-works at Haworth (now owned by the Keighley Corporation).

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The death is announced of Mr. BEVOUS J. SMITH, a Director of the Romford Gas Company. Mr. Smith joined the Board in 1908 and was Chairman from 1926 to 1946. His death at the age of 84 years severs a family connexion with the Board of the Company extending over a period of 100 years.

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The death occurred suddenly at Chippenham, on Jan. 18, of Mr. ARTHUR S. HELPS, who, until his retirement 14 years ago, was Manager and Secretary of the Chippenham Gas Company (now merged with the Bath Gas Company). Mr. Helps came of a family prominently associated with the Gas Industry. His father, Mr. George Helps, was for 49 years Secretary of the Bath Gas Company. Two of his brothers were for many years Manager of the Croydon and Reading Gas Companies respectively; a cousin was Manager to the Nuneaton Gas Company; and another brother was in the employ of the Bath Gas Company. Mr. A. S. Helps spent the first 17 years of his business career with his father at Bath and then moved to Croydon, under his brother. In 1904 he was appointed Manager to the Caterham Gas Company, and three years later he became Secretary and Manager to the Chippenham Gas Company, retiring in December, 1932, when the Company was merged with the Bath Gas Company.

Diary

Feb. 4.—North London District Gas Salesmen's Circle: "Of Time and Tide," R. J. Gregg, Sales Manager, Ascot Gas Water Heaters, Ltd., 7.30 p.m. Woodall House, Wood Green, N.22.

Feb. 5.—Institute of Fuel (North Western Section). "Work of the North Western Regional Fuel Efficiency Committee," P. D. Kirkman, Engineers' Club, Manchester, 6.30 p.m.

Feb. 7.—London and Southern District Junior Gas Association: "Some Investigations on Leakage from Distribution Systems," C. D. Shann. Gas Industry House, 7 p.m.

Feb. 10.—London and Counties Coke Association: Technical Committee, 2.30 p.m. Gas Industry House.

Feb. 11.—Midland Junior Gas Association: "The Engineer and the Accountant in the Gas Industry," R. Thompson, Bilston.

Feb. 11.—National Federation of Gas Coke Associations: General Committee, 10 a.m. Gas Industry House.

Feb. 12.—Manchester and District Junior Gas Association: Visit to Works at Trafford Park. Paper, "Industrial Gas," T. H. Pardoe (Stretford).

Feb. 14.—National Federation of Gas Coke Associations: National Technical Committee, 10.30 a.m. Gas Industry House.

Feb. 16.—Midland Junior Gas Association: Visit to the Keresley (Coventry) Colliery of the National Coal Board.

Feb. 19.—B.G.C. Domestic Development Committee, 2.30 p.m. Gas Industry House.

Feb. 20.—Institute of Fuel (North Western Section). "Review of the Work of R/16 Committee," Dr. E. G. Ritchie. Radiant House, Bold Street, Liverpool, 2.30 p.m.

Feb. 22.—Yorkshire Junior Gas Association: Paper by E. S. Carter, Distribution Superintendent, Halifax Gas Department At Bradford.

Feb. 25.—Southern Association of Gas Engineers and Managers (Eastern District: "Load Development and Distribution on the Adcot Company's Gas Supply Area," J. W. Kaye. Gas Industry House, 2.30 p.m.

Feb. 27.—Midland Junior Gas Association: Visit to British Refractories Research Association's Laboratories, Stoke-on-Trent, 2.30 p.m.

Mar. 5.—London and Southern District Junior Gas Association: "Technical Chemical Control of Gas-works," S. G. Vane. Gas Industry House, 2.30 p.m.

Westminster Employment Committee

Mr. J. R. W. Alexander, M.A., LL.B., General Manager of the British Gas Council, has accepted the invitation of the Minister of Labour and National Service to become the independent Chairman of the Westminster Employment Committee, in succession to Colonel the Hon. J. J. Astor, M.P., who has resigned after serving as Chairman of the Committee for the past 25 years.

The Committee, service on which is voluntary, comprises equal numbers of representatives of employers and employees, together with representatives of other local committees advising the Minister on special subjects, of local authorities and of social service organizations. The Committee covers a highly important employment area, and its purpose is to secure for the Ministry the full benefit of local knowledge and to bring the Employment Exchange into close touch with employers and employees, to which end it is entrusted with the widest functions of advice and guidance, and has to investigate criticisms by the public and suggest improvements.

The primary function of the Employment Exchange is to bring together employers requiring workpeople and workpeople seeking employment, and to organize the movement of labour from job to job and from district to district. An interesting development at Westminster has been the provision of suitable facilities for the private interview of employers and employees, in which connexion regard has been paid to equipment and environment and the psychological effect of colour.

The Committee, in addition to facilitating the full use of the Placing Service of the Ministry, has a new and important task in connexion with the Government's policy of maintaining a high and stable level of employment, which must be based on adequate, accurate and timely information and statistics as to the local employment position and prospects. Vocational training, resettlement, and welfare are other aspects of the advisory work of the Committee.

Increased Activities and Expansion of Staff has necessitated the removal of the headquarters of the Aluminium Development Association to larger premises. The Association's address is now 33, Grosvenor Street, London, W.1.

News in Brief

Darlington Corporation has accepted the tender of Whessoe, Ltd., Darlington, for the supply of an electrically operated precipitation plant for the gas-works. The tender of the same firm has been accepted for a static ammonia washer.

Strange But True.—During the performance of the play "Gaslight" at the Gateway Theatre in Edinburgh last week, the theatre manager received a telephone message for a member of the audience. It was from his wife to say that all the lights in their home had fused, and she was sitting in the dark.

After nearly 42 Years' Service as General Foreman with the Littleborough Gas Company, Mr. F. Law has retired, and at a pleasantly informal ceremony in the Company's office he received a presentation from the Directors, Staff and Employees. Mr. H. K. Lister, Engineer and Manager, made the presentation.

Referring to the Gas Supply in the town and the poor service some consumers were getting, Councillor D. F. Taylor emphasized at a meeting of the Horncastle (Lincs) Urban District Council that the mains system was the trouble and not the quality of the gas. The Gas Committee had in hand a big scheme for the relaying of the mains. Until that was done some consumers could not expect to get a good supply.

New Coke Oven Plant being built at the Norwood works of Priestman Collieries, Ltd., was referred to at a meeting of Gateshead Corporation. The Company stated that the new ovens would include modern developments and would give rise to much less atmospheric pollution than the old ovens. The present ovens would be taken out of commission when the new ones were ready. The Corporation members have been invited to inspect the new plant.

At a Meeting of the Middlesbrough Corporation it was reported that gas consumption was increasing at a phenomenal rate, but the undertaking was managing to meet all demands. The purifying plant was carrying a 50% overload, which was possible only through the careful and scientific control of the gas plant. The Corporation has decided to obtain tenders as soon as possible for a new purifying plant. The Corporation also intends laying an 18 in. gas main to the new trading estate at Middlesbrough and is asking the Board of Trade to contribute towards the cost.

A Slight Error occurred in the announcement with regard to the Bombay Gas Company in the "JOURNAL" last week. The paragraph should have read: "The Directors of the Bombay Gas Company have received from the Asiatic Textile Company—who offered to purchase the whole of the £300,000 stock at 50s. per £1 unit—a notification that they have received more than their minimum requirement of acceptances, but futher acceptances will still be received up to Jan. 23 as already announced. In accordance with the agreement of Nov. 28 payment will be made on or about Feb. 5 to stockholders accepting."

A Report on the Question of Compensation to be paid by the Government when nationalizing municipal undertakings has been referred back by the Middlesbrough Corporation for further consideration. The Gas and Electricity Committee had suggested that compensation should be on the same lines as that allowed to companies, and that in the interim all capital works should be met by borrowing. Several members opposed the suggestion on the ground that the Government would be able to acquire profitable municipal undertakings for a small sum. It was suggested that Middlesbrough would be penalized for being thrifty and careful.

Because an Employee of Henry Balfour & Co., Ltd., the Leven firm of gas plant contractors, refused to show them his apprenticeship papers, 150 fitters and turners at Durie Foundry went on strike last week. The man had been appointed supervisor of the tool shop. A deputation from the strikers was met by the management and an assurance was given that the management had seen the man's papers. The deputation, however, insisted that these papers should be shown to the employees' representative. The management refused to accede to this request, and, after hearing the report, the strikers decided to remain idle. The strike is unofficial, but the dispute has been referred to the district committee of the A.E.U.

The Cut in Allocations to Scottish steelworks, amounting to 25%, is likely to have a serious effect on Scottish industry. Already many West of Scotland steelworks are operating a shorter working week as a result of the cut in their coal allocation, and steelworks at which employment has already been affected include Glengarnock, Clydebridge, Shotts, Clyde Iron Works, Motherwell, Gartcosh, and other establishments. More than 15,000 workers in the industry will each lose one day's wage a week. The firms concerned have warned shipbuilding firms that under the new system deliveries of steel will be seriously affected. It has been authoritatively stated that if the reduced coal allocation lasts six weeks it will mean 400,000 less tons of steel a year, or a cut of 3% in output throughout the country. Industrial coke ovens, most of which are operated by the iron and steel industries, will receive 75% of their previous authorized throughput.

Stockton-on-Tees Corporation has accepted the tender of Ashmore, Benson, Pease & Co., Ltd., for the dismantling of four purifiers at the gas-works and the installation of four new purifiers, at a cost of £43,420.

The Five-day Working Week has been adopted by Tufnol, Ltd. and George Ellison, Ltd., of Perry Barr, Birmingham, whose offices and works will in future be closed from Friday evening until Monday morning.

The Free Issue of "Fuel Abstracts" in neo-style form is to be discontinued. In future the Abstracts will appear in rota-print form as a normal publication by H.M. Stationery Office on sale to the public. The annual subscription will be £2 10s., covering the 12 monthly issues with two half-yearly indexes.

An Advertising Campaign to get consumers to use less gas in being planned by the Brooklyn Union Gas Company of New York, which has already served notice to the public that supplies may be cut in the event of prolonged cold weather. Insertions will be made in all New York City newspapers and radio time will be bought.

The Haggerston Social Club of the Gas Light and Coke Company recently entertained nearly 200 children to a tea party at the Club's premises in Laburnum Street, Haggerston. Mr. R. Reeves, the Club Secretary, together with colleagues, served their guests with tea, and afterwards the children adjourned to a gaily decorated hall, where they enjoyed for two hours a splendid concert. The evening ended with each young guest being presented with a National Savings card containing stamps.

Mr. Abe Moffat, President of the Scottish area of the Nationa Union of Mineworkers, has announced an all-round improvement in Scotland's coal production for 1946. Coal production during the year, he stated, was 22,494,812 tons—an increase of 1,093,012 tons on the total for the previous year. This is despite the fact that the manpower in Scottish mines dropped by 1,336 men to 79,036 over the same period. Since the beginning of this year output has again increased considerably, and the figures illustrate the response made by Scottish miners since their return from the New Year holiday. Figures for the first week of the year showed an increased output of 40,000 tons as compared with the same period in 1946, and for the second week, an increase of 33,800 tons.

Mr. D. D. Melvin, Engineer and Manager, has reported to the Edinburgh Gas Committee that at the moment the Gas Department was receiving about one quarter of its coal requirements from the North of England—Durham and Northumberland. Coal had been received from these sources during the war because the output from Scottish coalfields was not sufficient. Before the war, one-third of their coal was obtained from Lanarkshire and the remainder from the Lothians. Very little coal was coming from Lanarkshire at the moment and something less than three-quarters of the total amount required was coming from the Lothians coalfield. At the present time sufficient coal was received for gas supplies, but the coal from the North of England was not the right type. They wanted coal which would not only yield a high amount of gas but would also give good coke.

Mr. F. Brinsley, Technical Service Manager of Radiation, Ltd., had an enthusiastic reception in Sheffield when, at the invitation of Mr. Ralph Halkett, General Manager and Chief Engineer, he gave the first of three lectures to an audience of over 60 members of the staff of the Sheffield and District Gas Company. The subject of his lecture was "Flame and its Use in Domestic Gas Appliances," and Mr. Brinsley illustrated many technical points by actual demonstration. A full description of flame formation in relation to the bunsen and neat gas burner was given and their application to gas consuming appliances was demonstrated. The lecture was followed by a discussion, and it was agreed that the lecture had been one of the most interesting given in Sheffield. Two other lectures are to be given by Mr. Brinsley on Feb. 13 and Mar. 20 and the subjects to be taken will be "Gas Cookers" and "Gas Fires."

The Clayton and Allied Firms Sports Association Annual Dinner was held recently in Leeds, under the Chairmanship of the President, Mr. R. G. Thomson. Over 100 members were present, and trophies for the various sections were handed to the winners by Mrs. R. G. Thomson. A special tribute was paid to Tom Brown, on leave from the Army, who won the "Cawthorne" Swimming Trophy. On one of the Association's angling trips he dived fully clothed into the river at Topcliffe and rescued a competitor from drowning. For this he was awarded the Royal Humane Society Certificate. A medal awarded to Mr. J. Donoghue, a member of the Works Ambulance Team, by the St. John Ambulance Brigade, in recognition of 15 years' continuous efficient service, was presented to him by Mrs. Thomson. A report given by the Secretary, Mr. J. Rathmell, indicated that plans were being made for extending the ground, the laying of a bowling green, and erecting another and larger pavilion with improved facilities.

GAS SERVICE

FOR readers desirous of keeping in touch with the activities and opinions of those on the service side of the Gas Industry, we give below a summarized pre-view of the February issue of "GAS SERVICE," enumerating the subjects covered and giving some indication of their nature.

District Heating

During the past year the floodlight of technical enquiry has been directed on the subject of district heating with a new appraisement. Interest was enhanced by the degree of time accorded it at the recent conference organized by the Ministry of Fuel and Power, when no less than seven Papers on the matter were presented. District heating is considered anew and receives further editorial comment. The advantages of decreased coal usage, absence of smoke and dirt and simplified transport are set against the disadvantages of enforced expense, congested pipe-ways, and of increased ventilation. In gas supply we have a form of district heating which has been proved by its long and successful history and which, while claiming advantages at least equal to those of hot water heating, admits none of the handicaps of heat loss in transmission and temperature limitation at the point of use. "If a gas undertaking was in the fortunate position of serving a district where every householder used gas to the full extent of his heat requirements, it would certainly have no difficulty in undercutting most of the figures given in these Papers."

Progress of the Gas Industry

Realizing that full cognizance of the development of the Gas Industry during its one hundred and thirty years of service, bearing in mind the economic conditions which prevailed, is necessary in order to plan and prophesy future success, David Fulton, Chairman of the Scottish Management Committee, in his Paper, "Accent on Progress," to the Eastern District Gas Salesmen's Circle, views the hopes and fears of the Industry through a saleman's eyes. He deals with water heating—which provides our finest chance of expansion, cookers—offering a plea for the increased use of steel and the resultant lower cost, refrigerators—again advocating lower cost and a wider range, and gas fires. Domestic heating, industrial gas usage, and publicity receive mention, and some of the results of nationalization are examined in detail.

Training

An authoritative note is struck by R. N. Le Fevre, Training and Education Officer to the Gas Light and Coke Company, in a condensed version of his Paper, "The Training of Gas Representatives," presented to the Home Counties (Western) Circle. Assuming a candidate has the essential grasp of elementary mathematics and is able to read and write good English, the respresentative must: (*a*) be able to "get on" with people; (*b*) have adequate common sense: (*c*) have a good practical background and be able to estimate and follow a job through; and (*d*) have sufficient technical background to appreciate the factors governing the selection of an appliance and its performance. With the national regionalization of the Gas industry, as foreshadowed by the Heyworth Report, the industry will become divided into three sections: production, distribution, and service. Regionalization may also provide more specialized representatives who are experts in their respective spheres of industrial gas, central heating, housing, public lighting, &c. Such men may require the Higher Grade in Gas Engineering (Supply).

Evolution of Gas Appliances

Since the days when a gas cooker was nothing more than a cylinder with a ring burner some distance below the door, the joint or bird being suspended on a hook, cookers have advanced, stage by stage, until the present degree of compactness, cleanliness and efficiency was reached. The ever-improving details of design are familiar to A. Forshaw, Chief Chemist of R. A. Main, Ltd., who in his Paper, "Improving the Breed," traces their development from the earliest days, through the "Middle Ages" (1890-1920), to the present. By 1890 oven design had become more or less stereotyped with the provision of a rectangular oven with an open bottom and drip tin, two grid shelves and a browning shelf, two bunsen burners at the sides, and a flue outlet at the back or top. They were sometimes packed with slag wool. The hotplate was supported on "bridges" screwed to the top of the oven and consisted of a wide rectangular cornice with a side gas rail, which supplied grill burner and boiling burners. For the following 30 years improvements gradually appeared on the mechanical side, but the liaison between the scientist and man with the rule of thumb experience was incomplete. It is, in fact, only during the last 25 years that progress has been made on the right lines by means of intensive research and co-operation between research worker, manufacturer, gas undertaking, and consumer.

Housing

One of the most interesting and satisfactory designs of post-war house is that accepted and put into practice by the Housing and Town Planning Committee of the Bootle Council. With a floor space of 934 super ft., these houses have several innovations in design. In particular the heating system, which includes a smokeless fuel stove capable of supplying domestic water and five radiators, and also a circulator heater, capable, in the case of a gas installation, of a make-up rate in the hot water tank of 11 gall. per hour through 100° as desired, commands attention, and full fuel costs are given. A photographic feature describes the housing experiment carried out at Boxhill recently with a new design of house which may be converted into two houses, one house and two flats, or four flats, as desired.

The Domestic Front

An important item of news for those interested in and connected with domestic reasearch is the formation, following the Markham-Hancock Report on the post-war organization of private domestic employment, of a National Institute of Houseworkers, with a Board of Directors under the Chairmanship of Miss Dorothy Elliott. Premises in Mount Street, W.1, are being prepared as a headquarters for the training institute where girls wishing to take up domestic work will be given six months' general training and further specialized courses. Included upon the Advisory Council are representatives of the Women's Gas Council, whose Organizing Secretary, Mrs. Abbott, has been invited by the Ministry of Labour to act as their representative upon this Council. The regular feature "A Woman's Viewpoint" examines domestic heating in America and the hygienic requirements of catering establishments.

Display

This issue contains the first of a series of articles entitled "The Showroom Window." by Triton—a pseudonym which conceals a well-known publicity expert in the Industry. Among the news photographs are several of current window displays.

Gas Engineers' Claim

A gas engineer who was Manager of the war-time heat treatment department of the Walsall Corporation Gas-works (said to be making an average profit of £30,000 a year), Frederick Thomas Guest, of Warley Woods, Smethwick, sued the Walsall Corporation at the Walsall County Court on Jan. 23 for £62 10s. guaranteed bonus, and £66 13s. 4d. damages for wrongful dismissal.

Plaintiff's case, conducted by Mr. Kenneth Nuguett, was that Guest in the responsible position which he held, with between 250 and 300 employees under him, was entitled to three months' notice; but that instead he received on Jan. 31, 1946, only a month's notice to terminate his engagement on Feb. 28. He said that he had merely regarded as a warning of the Committee's intention a letter which he received on Dec. 3, 1945, telling him that he would be given notice.

His commencing salary had been £400 a year, but this was raised to £500, and in April, 1942, the Gas Committee also decided to pay a bonus, which, in his case, would be at a minimum of £150 a year. In October, 1945, however, the Committee decided that the bonus would no longer be applicable, and his claim was for the proportionate bonus between that date and the termination of his engagement in February, 1946, for he contended that the bonus was regarded as part of his remuneration, and failing its payment he would have sought a salary increase.

Plaintiff, who told His Honour Judge R. H. Norris, that he took up another position at £500 a year immediately after leaving Walsall, also said, in reply to Mr. J. F. Bourke, who represented the Corporation, that he knew that the question of bonus was subject to six-monthly review by the Committee.

This fact was stressed by Mr. Bourke in his case for the respondents, who, he said, on April 1, 1945, decided that the bonus would still be paid until October that year, when it ceased, having regard to the fact that the plant was closed down and others who had been employed there, and had also received a bonus, had been suspended. Mr. Bourke also pointed out that, so far as salary was concerned, Mr. Guest had not suffered financially, and if it was held that he was entitled to three months' notice he would be entitled to only nominal damages.

Holding that three months' notice was reasonable for a man in Mr. Guest's position, Judge Norris, however pointed out that in effect he had notice not far short of that time. He thought that plaintiff was entitled to nominal damages, but he had not suffered financially because he went into new employment immediately. In the circumstances, although the claim was for £129 3s. 4d., he assessed the damages at one shilling and made no order for costs.

The Engineering Industries Association is getting in touch with kindred bodies to protest against the requirements of the Board of Trade under the Partial Census of Production. The Secretary General of the Association said recently that large firms would have to employ several accountants in an endeavour to compile intelligently the information required—that was without resource to guess work, but small firms could neither afford accountant's fees nor the time necessary. Some of the information asked for was never normally kept by engineering firms.

Town Gas as a School Subject

THE following is a report sent to us by Mr. R. J. W. Collinson and Mr. H. G. Tuchler on a project on town gas which was carried out with all third and fourth year forms of the Cottesmore Secondary School, Boys' Department, Nottingham (Headmaster, Mr. C. W. Leaning), during the autumn term, 1946. The aim was to discuss with the boys the technical and chemical principles of gas production on the one hand, and the social aspects of modern gas service on the other. The account reads:

A Group of Boys at Basford Gas-works.

"We began with classroom work (theoretical and practical) on levers, pulleys, cranes, and other devices which are used in industrial undertakings. Methods of heating were discussed next; after that we dealt with carbon, combustion, and by-products of carbonization. The chemical topics provided a direct transition to gas production and, to make the connexion clear, we built a model of a gas production plant, illustrating the various stages of manufacture.

"Having thus prepared the ground we came to the next point in the scheme: visits. A party of top form boys went to the works of the Staveley Coal and Iron Company, Ltd., at Hollingwood. There they saw coke manufacture, gas production, the use of gas in various industrial processes; and much attention was given to the by-products gained during the production of gas. Other parties of boys went to the Corporation Gas-works at Basford, Nottingham, to see gas and coke production as well as the manufacture of by-products there. During all the visits the boys made extensive records in writing and diagrammatic illustrations of the processes were shown to them. These records were then followed up in detail in the course of the following lessons at school.

"Parallel with this work on the scientific aspects of town gas production we studied the social side of the industrial and local government services concerned. At school, with the help of specially compiled duplicated notes, we discussed the development of the Gas Industry, the improvements brought about by the employment of gas, the huge importance of the by-products of gas manufacture, and present day distribution of gas in cities and rural areas; during the visits the boys chatted with the employees about their jobs and their working conditions, and they also got to hear about the problems with which the works are faced in this era of shortages of all kinds.

"The boys were by now quite well informed about the various aspects of town gas, and much interest had been aroused. It seemed desirable that, apart from the explanations and follow-ups in the classroom, the whole complex should be clinched and summarized once more comprehensively.

Lively and Spirited Debate

"We therefore invited the Chief Chemist of Basford, Mr. N. Calverd, to come to school to be interviewed by the third and fourth year forms. On request the boys submitted as many as 155 questions of which we picked 31. Actually Mr. Calverd did not have the chance to answer more than 16 questions for almost every one of his answers gave rise to a lively and spirited debate.

"On several occasions lately we have had in our school expert visitors to be interviewed by the boys in the course of projects on more generally important subjects. Again and again it is an experience to watch the deep seriousness with which boys of 13 and 14 years of age put questions, waited to see if the answers were really satisfactory, and sometimes added further enquiries to have all points clarified. In our opinion, such activity does not only awaken a boy's interest in his work generally but it also constitutes an important training in citizenship.

"Another way of summarizing the scheme was by the showing of the films "It Comes from Coal" and "Gas Manufacture," which the British Gas Council lent to us. Both films deal in an imaginative way with the uses of coal and gas in modern life and, although they overlap to some extent, this is not necessarily a disadvantage for teaching purposes.

"Thus our project on town gas drew to an end. It was carried out in three main stages: (1) Theoretical and practical preparation in school (including teaching with the help of models and duplicated notes, demonstration experiments and a good deal of experimental work done by the boys themselves); (2) visits; (3) follow-ups by discussions, expert visitor, and films. This sequence seems to us important: little purpose would be served by visits to the plants before the boys are familiar with the principles underlying the various processes; the visits themselves should illustrate the points made during the lessons. Lively and stimulating summaries help to fix the experiences in the minds of the pupils.

"It is essntial that any project which centres round a topic of general industrial and civic importance should be organized in close connexion between the school on the one side and the industrial and public service concerned on the other side.

"In our case, we acknowledge gratefully the help received from the British Gas Council, the Nottingham Gas Department, and the Staveley Coal and Iron Company, Ltd.

"This co-operation may in some cases perhaps cause a certain amount of extra work for the undertakings—but how much fruit will this extra effort bear in the long run! A youth who has watched various jobs with his own eyes will find it easier to select appropriate employment for himself when the time comes, than one who only knows about the job from the narrations of the Labour Officer. And aren't square pegs in round holes one of the main troubles of every employer? But, more than that, it is important that our future citizens obtain some idea of the working of the main industries and services. As it happens, the Corporation of Nottingham have decided to install a new gas production plant at the works which we visited. Our boys, having seen the difficulties Basford Works has in satisfying the needs of the City's growing population, are, of course, all in favour of the plan. But, whatever the issue, a high standard of knowledge concerning industrial and civic affairs can only be achieved if the ordinary citizen has had the opportunity to study the various systems for himself in a methodical manner.

"In April, 1947, the school leaving age will be raised to 15, and more time will then be available for a more extensive all round education. In these circumstances it does seem rather important to make the pupils familiar with topics of general interest like town gas; and it is to be hoped that an understanding of, and an insight into, the running of key industries and civic undertakings may have important bearings on the boys' future attitude both as workers and as citizens."

Copper and Zinc Control

As a result of discussions between the Ministry of Supply and trade representatives the licensing restrictions for copper and zinc have now been modified.

It will still be necessary for firms applying for licences for copper to certify that the metal is needed to cover orders and that full allowance has been made for scrap intake. The total tonnage of unwrought copper, which any firm is permitted to hold (including their stocks and forward purchases), has been increased to seven (instead of six) months' consumption at its average monthly rate of consumption in September and October, 1946. Firms whose current consumption exceeds by 10% or more their consumption in the basic period (September and October, 1946) may apply to be assessed on the higher basis.

In order that firms whose total holdings of copper exceed seven months' consumption may continue to book orders, the reduction of their position to seven months may now be effected more gradually; from Feb. 1 they may apply for licences to acquire for any calendar month a tonnage equivalent to 90% of their monthly consumption in the basic period. For the remainder of January the permitted tonnage in such cases will be 30%. In future all applications to the Directorate for licences to acquire copper must be accompanied by a purchase order. Contracts will then be issued as in the past. This means that where the copper is supplied by the Directorate, licences will no longer have any period of validity. Where the Directorate is not to be the supplier the licences will have a validity of seven days.

The same provisions as for copper apply to the licensing procedure for zinc, with the exception that the total holding of unwrought zinc must not exceed six months' consumption at the basic monthly rate.

The Problem of the Peak Load

IN the South of England the peak gas load normally occurs during the cooking of the Sunday mid-day meal, but in the North it appears that for many years the Monday morning wash-day has produced a much greater demand for gas. That, at any rate, has been the experience of the Halifax Gas Department. Mr. J. MacLusky, Engineer and Manager, has prepared the accompanying chart showing the output of gas per hour for the week from Jan. 2 to Jan. 8. The chart is fairly representative of what is occurring in other undertakings of the same size and even larger in the North.

It will be observed that the highest peak load on each day except Saturday is for the cooking of the mid-day meal and between 12 noon and 1 p.m. It is realized that practically the whole of the canteens, cafés, restaurants, and hotels use gas for cooking purposes as well as private houses, and the gas consumption for the boiling of water alone is very heavy for a limited period.

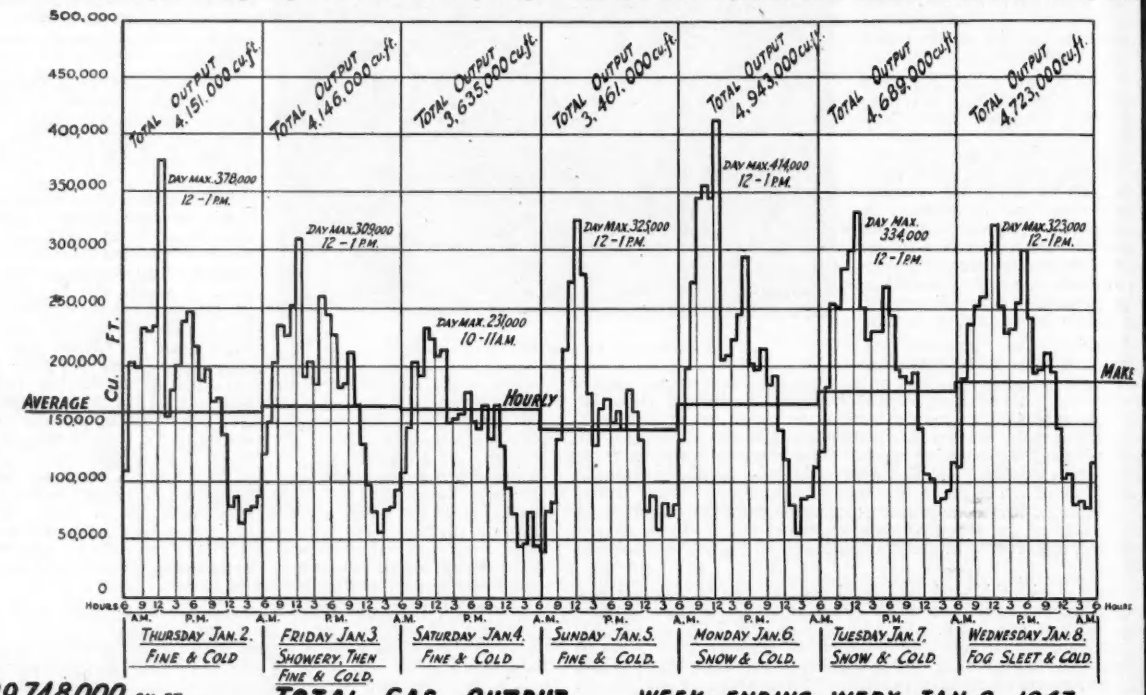
The chart reflects the habits of the people in so far as their uses of gas for cooking and other purposes is concerned. The tea-time and supper-time loads are very marked and the fish and chip shop load is also noticeable. In the North Monday has always been the peak day due to the use of gas for wash boilers and it will be seen that the load on Monday morning between 10 and 11 a.m. is greater than that required for the cooking of the Sunday dinner. The Saturday load has interest in as much as the peak occurs between 10 and 11 a.m.

and not between 12 noon and 1 p.m.

Extra demands are being made by the public for gas firstly because of the shortage of solid fuel, and secondly because of the greater amount of money available in normal homes and the desire to spend this in obtaining freedom from labour and greater comfort. Such cases have been reported in Halifax and other towns where, owing to the complete lack of solid fuel in houses, people have been driven to using the gas oven as the sole means of warmth, leaving the oven door open. In other cases a simple gas boiling burner with an over tray on top has been used to provide some measure of heat. Obviously where gas fires and radiators are available these are being used to a much greater extent than in normal years.

The Halifax Gas Department will have only one extra sub-unit of coal gas-making plant available to meet any additional demands and though the Corporation has received sanction to obtain tenders for the installation of further gas making plant it will probably be three years before this can be installed and put to work.

This position is similar to that existing in the electricity supply industry. The difference between the two industries is that the Gas Department can meet these peak loads because of having a floating stock of gas in the holders. During the days of heavy output shown on the chart, the Department depleted the stock of gas in the holders to a very great extent, and had to restore the stock during the week-end.



29,748,000 CU. FT. TOTAL GAS OUTPUT WEEK ENDING WEDY JAN. 8 1947.

German Industry Reports

Latest reports submitted by teams of industrial experts who have visited Germany under the auspices of the Combined Intelligence Objectives Sub-Committee, the British Intelligence Objectives Sub-Committee, and the Field Information Agency (Technical) for the collection of scientific and technical intelligence from German industry include the following:

B.I.O.S. 876. Coke Oven Gas Separation by Linde. J.G. Oppau. (6d.)

B.I.O.S. 913. Gas Meters in the British Zone of Germany and in Berlin. (8s.)

B.I.O.S. 971. The Utilization of Town Gas in Germany. (4s.)

B.I.O.S. 996. Detoxification of Town's Gas at Stadtgaswerke, Hameln. (6d.)

Reports, as they are published, are distributed to the chief public libraries, to universities, and to professional and scientific institutions and to the trade associations concerned. A limited number of copies are on public sale at the Stationery Office.

Returning Ex-Service men were welcomed home at the annual Staff Dinner of the Houghton-le-Spring District Gas Company. Our photograph shows Mr. G. W. Martin, Engineer and Manager, presenting each of them with a barometer.

Nationalization: Its Effect on Public Utilities

Policy of The Conjoint Conference

THE Annual Meeting of the Conjoint Conference of Public Utility Associations was held at Gas Industry House on Jan. 22, the **President**, Lord Falmouth, presiding.

The **President**, in moving the adoption of the annual report and accounts, first referred to the resignation of Colonel S. S. Ogilvie, who, as Joint Hon. Secretary, had attended many meeting of the Conjoint Conference in the past.

It was not too much to say that, had it not been for Colonel Ogilvie and Mr. Warner Terry, the formation of the Conference in 1925, and the 21 years of useful and successful work which now stand to its credit, would have been well-nigh impossible.

The year under review had been one of difficulty for industry and those difficulties which, to a certain extent, were natural in a period following the greatest war in the world's history, had been accentuated by the Government's policy of nationalization. The coal industry, upon which gas and electricity depended, had already been nationalized, although it was too early to form any reasoned opinion as to whether the transfer of colliery undertakings to the National Coal Board would achieve that cheap and abundant supply of coal which had been promised. Many considered that the admitted defects of the coal industry could not be remedied by the mere passing of an Act of Parliament, but he was at least certain that none would envy the immense task that faced the National Coal Board at this critical moment in the history of the industry. The Conference, representing as it did, the consumers of no less than 25% of the total mined coal production of the country, or some 40% of industrial coal, could not be indifferent to the state of the coal industry, and now that, for good or ill, the National Coal Board was in the saddle, they could but wish them well.

Coal Industry Nationalization Act

There were certain aspects of the Coal Industry Nationalization Act which caused apprehension. Too much power was placed in the hands of the Minister; for instance, the members of the Industrial Coal Consumers' Council would be the nominees of the Minister, and whatever might be their recommendations on a dispute submitted to them, it still remained a matter for the Minister to decide what, if any, action should be taken to give effect to those recommendations. That type of Council in other industries had hitherto failed to be effective, and their efforts would be wasted if members of those Councils were asked to give their time and experience in considering the consumers' problems, unless there was some assurance that their findings would be made effective. When the Bill was in Committee Stage in the House of Lords he moved an amendment, on behalf of the Conference, to permit disputes as to quality and price adjustment to be referred to an independent arbitrator, and although there might have been technical difficulties in the way of accepting this particular amendment, he still maintained that a consumer should have an opportunity of obtaining redress from some tribunal which was free from Ministerial direction and in a position to ensure that its decisions should be implemented.

Transport and Electricity Industries

Many considered that, before introducing legislation for the nationalization of other industries, it would have been in the national interest to allow sufficient time to elapse to demonstrate whether the claims made for national ownership were in practice justified. The Government, however, decided to introduce at the beginning of the new Session a Bill to nationalize the transport of the country, and this had already been read a second time in the House of Commons. A similar Bill, applicable to the electricity industry, had also been introduced into the House of Commons and awaited second reading.

The Transport Bill had been vigorously opposed by the transport interests, and electricity supply and power companies were of the opinion that the transfer of that industry to national ownership was not in the general interests of the electricity consumers of the country.

The interests represented by the Conjoint Conference were vitally affected by the proposal to nationalize the transport of the country. The gas and electricity members of the Conference were naturally mainly interested in the conveyance of coal, which was their essential raw material. The conveyance of coal at reasonable rates was, however, vital to the well-being of the country at large, and any distribution of function as between road and rail must be carefully judged from that standpoint.

Further, the maintenance of their own wagons—in many cases specially designed for the requirements of the utilities' private sidings and unloading plant—had been a matter of much thought to many public utility undertakers. It was inconceivable that so large a number of undertakers would have used their own private coal wagons if they had not thereby obtained some corresponding economic advantage. Those wagons were now to be compulsorily acquired by the State on terms which could not be regarded as satisfactory, and undertakings would be forced to accept any wagons sent into their sidings by the British Transport Commission. Thus, many would be obliged to incur further capital expenditure in order to facilitate the reception of less suitable wagons, and this additional expenditure would necessarily be reflected in increased charges for gas and electricity services.

While the public utilities were largely dependent upon the railways for the conveyance of their main raw material, they were also large users of road transport for other purposes, and could not view the proposed curtailment of the rights of "A" and "B" licence holders with equanimity. Flexibility should be the guiding principle of road transport and this was just what might be lost by the imposition of a bureaucratic system of licensing.

The Gas Industry

The Government did not propose to introduce a Gas Industry Nationalization Bill this Session, but it was their declared intention to nationalize the Industry during the lifetime of the present Parliament. The British Gas Council was opposed to the principle of the nationalization of the Gas Industry, but was prepared to co-operate with the Ministry of Fuel and Power in the detailed implementation of the Government's proposals so as to ensure that the nationalized structure and organization of the Gas Industry were such as to maintain an efficient and economic gas service to the public.

With regard to the water interests, the fact that the present Government had placed the Water (Scotland) Act upon the Statute Book suggested that it was their policy to allow the water industry to continue to maintain its present structure, subject to the Water Code recently revised by the Water Act, 1945. This was understandable as, except in the case of a few large cities, the needs of the population of the country were supplied from water resources to a large extent in the hands of the various local authorities. In the whole of Great Britain, including the remoter parts of Scotland and Wales and the islands off the coast, only 6% of the population was without a piped supply of water, and the water industry was justified in the pride with which it would soon celebrate the centenary of the passing of the Waterworks Clauses Act, 1847.

Conference Policy on Nationalization

Since the measures for effecting the nationalization of the transport and electricity industries had not, like the Coal Industry Nationalization Act, become law, it was impossible to discuss them without entering upon the somewhat dangerous arena of politics. It was outside the province of the Conjoint Conference to take any part in political controversy, and the attitude to be adopted to the principle of nationalization was obviously a matter to be decided by the national organizations of the industries affected.

He thought, however, that he might with justification ask what benefit the consumer of gas or electricity was expected to obtain from the nationalization of those industries. It was always necessary to bear in mind that those public utilities did not sell an article but provided a continuous service. The cost of that service was largely dependent upon the nature and extent of the public demand. The factors which went to make up that cost, in addition to capital charges, comprised coal, wages and salaries, maintenance and renewal of plant (production, transmission, and distribution) and consumer service. These factors would remain unaffected by nationalization unless there was to be a material reduction in the quality of the service provided.

There was the further danger that additional charges would be placed upon consumers in built-up areas to subsidise the supply in rural districts. He was apprehensive that it would be too easy to conceal a loss made by one section of a nationalized industry, either by directly or indirectly subsidizing that industry from the resources of another section of the industry. Further, in these days it might be felt politic to bolster up export trade at the expense of nationalized home industries, which was another form of concealed subsidy. There would be no obligation upon the nationalized industries to make a profit, and the State could ill afford at the present time to jeopardize the large sums paid to the Exechequer by the transport, gas, and electricity interests in the form of income tax.

There was no doubt that the main interest of many of the Association Members of the Conjoint Conference would, during the present year, be directed to the future organization of their own industries, and they might find that, with that predominant interest, they would have little, if any, time to consider measures by which they were less directly affected. For that reason it appeared to him to be more important than ever that until nationalization was effected the Conjoint Conference should continue, in all matters in which joint action could be taken, to act as watchman of the public utilities of the country.

The Conference was not concerned with the political theories or ideologies which might lead to the introduction of any particular measure; its task was rather to consider each Bill, as introduced into Parliament, on its merits and to obtain, wherever possible, adequate protection for the public utility interests of the country.

The policy of the Conjoint Conference in those matters was well illustrated by the steps taken by the Conference during the passage of the Coal Industry Nationalization Act through Parliament. The Conference took no part in discussions regarding the advisability or otherwise of transferring the ownership of colliery undertakings to the National Coal Board, but directed its attention to each Section of the Act and endeavoured to take such action during Committee Stage as would best safeguard the large coal-consuming interests which it represented. A similar policy had been adopted with regard to the wide range of subjects which were covered by the annual report.

Mains and Cables in Highways

It was satisfactory to be able to report that the Joint Negotiating Committee on Mains and Cables in Highways, consisting of representatives of the Highway Associations and of the Conjoint Conference, had come to a final agreement. The Conference came into being primarily to defend the common interests of public utility undertakings as users of the highways and the settlement of a code of provisions, as embodied in the negotiated Clause, could, he thought, be regarded as one of the important achievements of the Conference. Twenty or more years ago, when the removal of public utility apparatus was rendered necessary by highway reconstruction, the public utility undertaking almost invariably had to pay the cost. Gradually, mainly as a result of united action through the Conjoint Conference, precedents were built up, both in public and private legislation, which provided that where the removal of mains and cables could be regarded as an essential part of the highway reconstruction, the cost of such removal should be paid by the highway authority. It had been no easy task to convince Parliament and the Highway Associations that this solution of the problem was just and equitable, and they might, therefore, be excused some slight self-congratulation on the success which had been achieved, with the co-operation of the Highway Associations, in this respect. He noted with interest that two London Gas Companies had incorporated the agreed Clause in Bills which they were promoting this Session.

The importance of obtaining a right relationship between highway authorities and public utilities who were empowered to break open public highways was fully appreciated by the Ministry of Transport, which had expressed its willingness to introduce public legislation on the subject as soon as Parliamentary time would allow. The law on the matter could scarcely be regarded as other than chaotic; there was at present no standardization in the highway protective clauses contained in the Acts and Orders of individual public utility undertakings, and there were cases where two or more distinct codes were applicable in the area of the same undertaking. The newly negotiated Clause would only become applicable as and when it was incorporated in the Private Acts and Orders of individual undertakings. Further, whereas municipalities and Urban District Councils came largely under the Public Health Acts, which provided for some measure of compensation, County Councils proceeded under an entirely different code contained in Acts passed more than a century ago, before the importance of public utility undertakings had attained its present magnitude. Again, although the powers conferred upon local authorities as housing authorities by the Housing Act, 1936, and as town and country planning authorities by the Town and Country Planning Act, 1944, were in some respects overlapping, the Acts contained entirely different provisions regarding compensation for any removal of mains and cables which might become necessary. It was not, therefore, surprising if some local authorities endeavoured to operate the Act which imposed upon them the least onerous obligations with regard to the payment of compensation to the public utility undertakings affected.

War Damage

Another subject to which he desired to refer was war damage. The annual report dealt with this subject at some length, as they desired to call attention as strongly as possible to the fact that, more than a year after the cessation of hostilities, and five years after the publication of the Government's proposals in a White Paper on the subject, public utilities still did not know the precise nature of the damage which would be covered by the proposed Public Utilities War Damage Scheme and the extent of their financial liability in respect of contributions to be paid thereunder. Many undertakings had for several years been holding sums in reserve to meet their eventual liabilities and had suffered no little inconvenience as a result of the absence of precise information as to the contents of the Scheme. That was another practical issue which, he believed, could be settled without delay, but he feared that, in competition with Bills which were politically more attractive, it was doomed to a low priority on the list of measures now awaiting Parliamentary attention.

Lord Falmouth also mentioned the work of the Public Utilities Coal Committee, which had greatly increased both in extent and importance during the year. They desired, he was sure, to express thanks to the members of that Committee, who devoted so much of their time to its all-important and exacting work. The assistance which the Committee had afforded to the Ministry of Fuel and Power had been repeatedly acknowledged.

There was no need to dwell upon the deplorable position of coal stocks, with which they were all too familiar. There was little doubt that an even more serious crisis had been averted by the labours of the Public Utilities Coal Committee. The miners of the country had been the subject of considerable criticism, but it was only fair to acknowledge that, with reduced manpower, the output per miner had shown a slight increase in recent weeks. That increase, however, had been more than counterbalanced by the heavy additional demand for gas and electricity by both domestic and industrial consumers, which had involved widespread cuts in electricity, and in a few areas a reduction in gas pressure.

Utilities Coal Joint Committee

He also mentioned the Utilities Coal Joint Committee, consisting of representatives of the Mining Association and the Conjoint Conference, to which on several occasions disputes as to the quality of coal and price adjustment had been successfully referred. That Committee ceased to operate on Jan. 1, and its functions would be transferred to the Industrial Coal Consumers' Council, on which the Conjoint Conference would be represented. The Minister of Fuel and Power had expressed his appreciation of the work carried out by the Committee.

The coal situation had undoubtedly been aggravated by transport difficulties, particularly the shortage of locomotives and coal wagons. During the year the Conference had received few complaints from the railway companies of delay in the turn-round of wagons, and that was due to the appreciation of the fact that any alleviation of the coal situation to a certain extent depended upon a speedy return of wagons to the collieries. Where there had been delays in the unloading of wagons, the fault had seldom been with the public utility undertaking, although it must be realized that it was sometimes impossible for the railway companies to avoid " bunching " and irregular deliveries of coal directed to public utility undertakings. The continuance of the Demurrage Charges Order was undoubtedly irksome, but there appeared to be little prospect of obtaining a repeal of the Order under existing conditions. On several occasions cases of individual hardship had been presented by the Conjoint Conference to the Demurrage Sub-Committee of the Railway Clearing House, and those cases had invariably received a courteous and careful hearing, as a result of which several satisfactory settlements had been negotiated.

Future of the Conference

Lord Falmouth concluded: " We stand on the brink of a new year and no one can tell what that year will bring forth. It may be that during the year the electricity industry will pass into national ownership, and it is impossible to forecast the future of the Electricity Associations who are members of the Conjoint Conference. Next year the same doubt may arise with regard to the Gas Association members of the Conference. The future of the Conjoint Conference is, therefore, uncertain. There will, however, still be many questions upon which the advantages of combined action will be apparent, such, for instance, as negotiations with highway, town and country planning, housing and other authorities. In addition, many problems will arise in connexion with income tax and, in particular, rating assessments, where it may be necessary in the immediate future to defend with some vigour the accepted principle that public utility undertakings are to be assessed upon the basis of their receipts and profits. I feel that it is unlikely that the Conference in its present form can survive the nationalization of the Gas, Electricity, and Transport Industries. Those industries, however, even when nationalized, will be faced with a variety of problems regarding which their interests are identical, and there are good grounds for the view that some machinery may be devised through which the benefits of units action may be secured."

Mr. **H. Berry** seconded the adoption of the report and accounts, and said that anyone reading the report could not fail to be struck by the amount of work done during the year. Tribute was due to the work of the Joint Secretaries and their staff. Whatever might be the future of the Conference, it had a long and honourable history and there was still a tremendous amount of work for it to do.

Sir **John Dalton** proposed the re-election of Lord Falmouth as President. He had occupied that position since the beginning of 1939, and they could count themselves fortunate in having a man of his attainments, his eminence, and his kindliness to preside over them. He had always taken a great interest in the affairs of the Conference, and had advanced their cause in the House of Lords.

Mr. **Michael Milne-Watson** seconded the resolution.

The **President,** in reply, said there was a great deal of important work to be done in the next 12 months.

On the proposition of the **President,** seconded by Mr. **A. J. Fippard,** the following Vice-Presidents were elected: M. A. E. Sylvester (representing gas interests), Sir John Dalton (electricity), Mr. H. Berry (water), and Mr. Stanley Kennedy (transport).

The **President** proposed a vote of thanks to the staff, whose work in the past year had been extremely arduous. They appreciated all the work they had done, and he specially welcomed Mr. Stemp, in place of Colonel Ogilvie, as Joint Secretary.

Australian Attitude Towards Nationalization

"The Gas Grab"

THE Victorian Government recently presented a Bill in Parliament for the acquisition of the Metropolitan Gas Company of Melbourne and certain other undertakings in the Melbourne area. The scheme includes all the undertakings of the Colonial Gas Association operating in that area.

The Bill was duly passed by a small majority, but has been rejected by the Legislative Council. However, the Government states that it has no intention of shelving the Bill and an attempt will be made to bring it before Parliament again in March.

In this connexion, we have received an article from the Colonial Gas Association which, is in fact, a reprint from *Industrial Australian and Mining Standard*. We reproduce it here to show the attitude towards nationalization on the other side of the world. It is headed "Gas Grab—Thin End of Wedge."

"A tooth and nail fight should be made against the Victorian State Government's proposals to nationalize the gas companies. Too many people are apathetic about this sort of thing, meekly accepting the constant parrot cry that 'utilities' are different from other industries, and that there is a stronger case for nationalizing 'utilities' than there is in other spheres. That is nonsense. It is a specious plea that represents the thin end of the nationalization wedge. Once such key industries as power production and the main forms of transport are conquered, then the nationalizers will look around for something else. Banking and insurance will come next, followed by trustee companies and other financial concerns in the field of services; coal, steel and so on in the heavy industries; shipping would follow air and rail transport (accompanied by artificial restrictions on privately owned road services); Government stores might enter the retailing field; and if the Minister for Information (Mr. Calwell) had his way, even the radio and the Press would become Government instrumentalities. Already housing construction, once a feature of private enterprise, is coming more and more under the thumb of a Government Commission. The Victorian gas companies are now fighting a battle for the whole of private enterprise.

For What Reasons?

"Let us look at this proposition that public utilities should be Government-owned. For what reasons? For efficiency? Definitely no. Because they are monopolies? This is not accurate. They are in indirect if not direct competition with alternatives. In any case, it pays even a monopoly to give good service and obtain maximum custom. Any abuse of monopoly—and we have yet to hear of any on the part of any privately-run Australian gas or transport concerns—would be countered, if necessary, by other means without socialistic ownership. Charges too high? They are usually higher under Government management, with no economic pressure for reductions, and with any loss simply being passed on to the taxpayer.

"Take, as an example, the Metropolitan Gas Company of Melbourne. The nationalization fanatics began their campaign with allegations about inefficiency and lack of service on the part of the company because it had to ration gas to consumers. They found it convenient to overlook the real fact that the gas shortage was entirely due to lack of coal from New South Wales, where, under a Socialist Government, the miners were simply thumbing their noses at authority, and refusing to produce adequate supplies. It is quite obvious that Victoria would have been short of gas, no matter who owned the gas companies, Government or otherwise. It was pure humbug on the part of the Chief Secretary (Mr. Slater), moving the second reading of the Gas Commission Bill, to suggest that nationalization would cure the position. The Metropolitan Gas Company was accused of failing to expand its plant, notwithstanding that it had planned its extensions and that these, like those of many others, were held up by war-time factors quite beyond the control of the company, or for that matter, of the Victorian State Government. Finally, the State Labour Government claims that it wants Victorian brown coal used for gas making, and that the large capital expenditure involved necessitates Government ownership—a plea as false as the others.

"The Metropolitan Gas Company has never had the least difficulty in raising all the capital it needed. Its shares have been issued by public auction, and investors have bid eagerly and paid premiums, often as large as, if not larger than, the capital itself, for the opportunity of subscribing. Not only is this a tribute to the efficiency of the Company, as judged by shrewd investors, but it proves that the Company can get any amount of money it wants for what its directors deem economic propositions.

"On the question of price, it should be noted that the Metropolitan Gas Company reduced the price of gas in 1936, and has since absorbed the increased costs of higher wages, inferior classifications of coal from New South Wales, and other items, as well as exorbitant taxation. It has reduced its dividends to shareholders to the vicinity of 5% on funds employed, but until this latest nationalization proposal, the market continued to rank the shares as worthy of £13 a £5 share. No complaints have been made about the dearness of gas. It would be more likely to become dear under a Government regime.

"On the score of efficiency, the Government will find it impossible to show how public servants could improve on the Company's present management. The Victorian Labour Government points to its State Electricity Commission as an efficient State enterprize. A good deal can be said, too, for efficiency in the running of the Victorian Railways, and the State Savings Bank and Credit Foncier of Victoria. But that does not make a case against the gas company. Nobody knows what stage of efficiency the State Electricity Commission, the Victorian Railways or the State Bank would have reached under private enterprise. Certainly it would have been no less than under their existing managements. But this point is noteworthy—the greater the degree of freedom from political interference that has been given to State undertakings, the greater has been their success. In contrast with the Credit Foncier for instance, were the millions of pounds lost in the State-run Closer Settlement schemes.

"The gas companies in Australia have not failed in any way to do what the public expected of them. The proposal to nationalize any of them is based on a theoretical ideology, not on practical results. This fanatical ideology should be roundly opposed wherever it raises its head."

University of Leeds

The following programme of Special Courses in the Department of Coal Gas and Fuel Industries with Metallurgy at Leeds University for the present session has been announced. Intending students should send their names without delay to the Registrar of the University, specifying which course or courses they wish to attend. Other enquiries regarding the courses should be addressed to Dr. A. L. Roberts, Acting Head of the Department.

Utilization of Fuels—Solid and Gaseous.

A series of ten lectures on the distribution and utilization of solid and gaseous fuels.

(A) Two lectures by Mr. F. L. Atkin, Assistant Distribution Engineer, Birmingham Gas Department, 2 p.m. and 3.30 p.m., Feb. 17. "The Distribution of Gas" (i) Low pressure systems: layout and design—type of mains and joints—mainlaying practice—services and service connexions—tracing leaks and repairs to mains. (ii) Reinforcement of low-pressure systems: (*a*) high pressure gas: (*b*) local boosters: (*c*) district holders—low and high pressure. Pressure control and governors.

(B) Two lectures by Mr. J. F. Waight, B.Sc., Assistant Superintendent of Industrial Heating Section, Birmingham Gas Department, 2 p.m. and 3.30 p.m., Feb. 24. "Industrial Gas Practice": Industrial gas burner equipment and control systems. Practical application to various types of industrial equipment.

(C) Two lectures by Mr. F. Brinsley, M.Sc.(Tech.), Technical Service Manager, Radiation, Ltd., 2 p.m. and 3.30 p.m., Mar. 3. "Domestic Gas Appliances": General considerations with particular reference to the performance of domestic gas appliances with different qualities of town gas. Development in the design of gas cookers, gas fires and water heaters.

(D) Two lectures by Mr. W. Davidson, Ph.D., Radiation, Ltd., 2 p.m. and 3.30 p.m., Mar. 10. "Domestic Solid Fuel Appliances": General considerations of advances in design and performance of domestic appliances using all types of solid fuel.

(E) Two lectures by Mr. J. F. Davis, A.R.I.C., South Metropolitan Gas Company, 2 p.m. and 3.30 p.m., Mar. 17. "Centralized Heat Supply": Development of centralized heat supply.

The fee for each section is 5s.; for the five sections together 17s. 6d.

By-product Coking Processes (including the Utilization of Coke Oven Gas for Public Supply)

A series of eight lectures by Mr. F. H. Metcalf, B.Sc., A.M.Inst.F., Chief Research Chemist, South Yorkshire Chemical Works, Ltd., Mondays at 2 p.m. and 3.30 p.m., commencing Jan. 20 and concluding Feb. 10. Syllabus: Historical development of coking. Choice and preparation of coals. Description of typical ovens, and their controls. Treatment of crude gas, manufacture of sulphate of ammonia and concentrated ammonia liquor. Recovery and rectification of benzole and toluole. Use of coke oven gas for public supply and chemical manufacture. Fee for the course, 15s.

Metallurgy

A course of four lectures by Mr. J. R. Rait, B.Sc., Ph.D., A.R.I.C., Research Department, Wm. Jessop & Sons, Ltd., Sheffield, Feb. 11 and 18, at 5 p.m. and 6.30 p.m. Subject: Slag-metal Reactions in Steelmaking. Fee 5s.

Refractory Materials

A course of two lectures by Mr. A. T. Green, O.B.E., F.R.I.C., F.Inst.P., Hon.M.I.Chem.E., Director of Research, British Refractories Research Association, Mar. 4, at 5 p.m. and 6.30 p.m. Subject: The Durability of Refractory Materials for Carbonizing Plant. Fee for the course, 5s.

Third Arthur Duckham Research Fellowship Report: 1945-46*

Energy Transfer from Flame Gases to Solids

By J. K. KILHAM, B.Sc., Ph.D.,
(Arthur Duckham Research Fellow)

THE amount of heat radiated from a flame is comparatively low, rarely exceeding 15% of the total heat of combustion. In order to utilize the heat more efficiently a solid is usually introduced into the flame, and the energy transferred from the flame to the solid is used either as radiation from the solid, as in a gas fire, or by conduction to any material in contact with the solid.

The mechanism whereby energy is transferred from the flame to the solid is by no means clearly understood, and the present work was undertaken in an attempt to elucidate this problem.

The possible processes involved are considered to be:—

(1) Forced convection from the hot flame gases to the solid. This appears to be the obvious mechanism, and there is little doubt that it contributes a large proportion of the total heat transferred.

(2) Catalytic combination of free radicals or atoms in the flame gases, on the surface of the solid, with liberation of energy.

It has been demonstrated fairly conclusively from spectroscopic data that free radicals and atoms such as CH, OH, C_2, O and H have a transient existence in combustion processes, and it is therefore conceivable that these unstable species may undergo re-combination on the surface of a solid.

As an example of this type of reaction, the re-combination of hydrogen atoms is promoted by platinum and the heat liberated corresponding to the reaction:—

$$2\,H \longrightarrow H_2 + 103{,}000 \text{ cal.}$$

is imparted to the platinum. This method has been used to estimate the concentration of hydrogen atoms in a gas.

(3) Catalytic combustion on the surface of the solid.

The researches of W. A. Bone[1] showed that it was possible to obtain flameless incandescent surface combustion by burning gas-air mixtures in contact with surfaces of refractory materials at red heat, and in fact the Bone-M'Court radiophragm process was developed along these lines. It is doubtful, however, whether sufficient unchanged gas and air is present in a normal flame for this process to be of any importance to the case under consideration.

(4) Transference of excess energy from high-energy gas molecules to the solid by collision.

During combustion processes, the energy which is liberated does not always appear immediately as an increase in the kinetic energy of the molecules of the system. Part of the energy may be used up in raising the potential energy of some particular species, and a finite time may elapse before this energy either appears as radiation or is degraded to normal thermal energy of the molecules. According to W. T. David[2] this "latent" energy may amount to as much as 28% of the heat of combustion in a carbon monoxide flame. Experimental evidence is the fact that a platinum wire immersed in the flame gases attains a far higher temperature than a similar quartz-covered wire, and this cannot be accounted for in terms of the different emissivities of the surfaces. David and Davies[3] suggested that the newly formed carbon dioxide molecules are of abnormal structure, and A. G. Gaydon,[4] as a result of a spectroscopic investigation of carbon monoxide flames, postulated that the CO_2 molecules initially formed have a triangular structure and that their life period in this configuration may be appreciable. The triangular molecule may revert to the normal straight-line molecule, either by the emission of radiation or by collision with another molecule or a surface. It must be emphasized that this latent energy is only appreciable in the combustion of pure dry carbon monoxide, traces of hydrogen or water vapour promoting its degradation to normal thermal energy. The exact mechanism whereby the excess energy may be transferred to a solid is not clearly understood, but as a result of David's experiments it is obvious that in certain cases it can be appreciable, *e.g.*, the temperature difference between the bare platinum wire and the silica-coated one is sometimes as much as 300°C.

(5) Exothermic displacement of equilibria—*e.g.*, the water gas equilibrium.

The temperature of a solid immersed in a flame will always be less than the temperature of the flame gases, consequently its presence will lead to a modification of the water gas equilibrium in the gases in its vicinity. Lowering the temperature of the gases will result in increased formation of carbon dioxide and hydrogen, with consequent emission of heat. Hartley[5] calculated that the increase in energy input to the solid by this mechanism does not exceed about 2½% of the total, so that the process is relatively unimportant.

From the above discussion it will be seen that in general the bulk of the energy transfer is by forced convection; the other processes, if taking place at all, would only be expected with certain combinations of gases and solids. A study of forced convection from flame gases to solids is, therefore, being undertaken first, since any anomalies found in the results should give an indication as to whether other mechanisms of energy transfer are involved.

Before dealing with the experimental work it will be advantageous to recapitulate briefly some of the laws of forced convection and radiation.

Fundamental Principles of Heat Transfer

Heat may be conveyed from one region to another by conduction, convection and radiation.

Conduction involves the transmission of heat from one part of a body to another part of the same body, or from one body to another in physical contact with it, by the continuous flow of molecular kinetic energy through the body. This process will not be enlarged upon since it has little bearing on the work in hand.

Convection involves the actual movement of particles of the fluid, which can either result from differences of density between hotter and cooler parts, as in natural convection, or by mechanical means, such as an artificially created pressure difference, as in forced convection. The process of forced convection in gases will be considered at greater length, since it is one of the means whereby energy may be transferred from flame gases to solids.

Among the types of forced convection which have received most attention are:—

(1) The heat transfer between the external surface of a cylinder and a stream of gas flowing at right-angles to its axis.

(2) Heat transfer from a stream of gas flowing parallel to a plane surface.

Both experimental and theoretical evidence indicate that the heat transfer is directly proportional to the temperature difference between the surface and the gas. Complete theoretical analysis of the process of forced convection is very complicated, since such a large number of variable factors are involved—*e.g.*, turbulent motion, velocity, density, specific heat, thermal conductivity and viscosity of the gas—as well as the size, shape and temperature of the solid. In fact the equations have only been solved by making simplifying assumptions which detract considerably from the practical value of the results.

Fortunately, the principle of similarity, while not providing a theory of forced convection, may be used to corre-

* Third Arthur Duckham Research Fellowship Report: 1945-46, presented at the Autumn Research Meeting, 1946, of the Institution of Gas Engineers.

late experimental data and so extend their range of usefulness. The application of the principle of similarity involves the proper selection of the variables and expression of their dimensions in terms of fundamental units. The method of indices is then used to find how any set of variables may be arranged in dimensionless groups. It will be sufficient for the present purpose to give the results only, without going through the process at length.

The heat transfer, H, per unit area of surface, per unit time, between the body and the gas would be expected to depend upon the linear size of the body, l, the temperature difference between the body and the gas, θ, the thermal conductivity, k, absolute viscosity, μ, specific heat, c, and the mass velocity, V, of the fluid, besides the shape and the position of the body.

The principle of similarity shows that these variables do not all affect the problem independently, but that the value of $\frac{Hl}{k\theta}$ depends only upon the values of $\frac{Vl}{\mu}$ and $\frac{c\mu}{k}$ and the shape and position of the body. For a given gas the value of $\frac{c\mu}{k}$ is practically a constant and may be omitted. Thus by constructing a graph in which $\frac{Hl}{k\theta}$ is plotted against $\frac{Vl}{\mu}$ all the experimental data for any particular arrangement can be represented by points which, within the limits of experimental error, should lie on a single curve. On account of the wide range to be covered, it is usually more convenient to plot the logarithms of $\frac{Hl}{k\theta}$ and $\frac{Vl.}{\mu}$ As an example, the case of air flowing at right angles to the axis of a cylinder will be taken. Fig. 1, which has been constructed from data given in McAdams,[6] shows the curve obtained over the following range of values:—

Diameter of cylinder (d)	= 0·0004 to 5·9 in.
Air velocity	= 0 to 62 ft. per sec.
Air temperature	= 60° to 500°F.
Cylinder temperature	= 70° to 1,840°F.

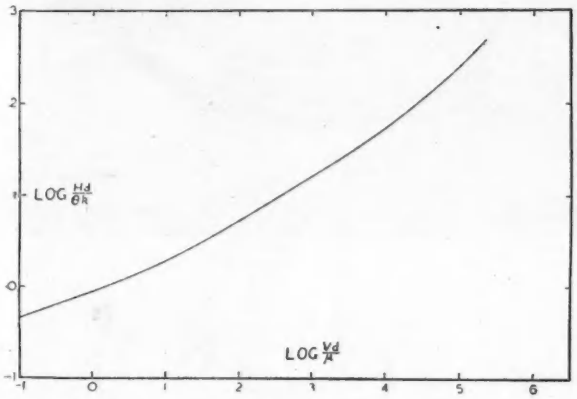


FIG. 1

The following equation may be used for values of $\frac{Vd}{\mu}$ between 0·1 and 1,000:—

$$\frac{Hd}{k\theta} = 0.32 + 0.43\left(\frac{Vd}{\mu}\right)^{0.52}$$

This equation only applies for air where $\frac{c\mu}{k} = 0.74$, but for any gas the equation:—

$$\frac{\frac{Hd}{k\theta}}{\left(\frac{c\mu}{k}\right)^{0.3}} = 0.35 + 0.47\left(\frac{Vd}{\mu}\right)^{0.52}$$

may be used.

In the case of a stream of gas flowing parallel to a surface it is not feasible to correlate the limited data available by the similarity method.

Heating by radiation differs from convectional heating in that the energy is transferred directly from the source to the object to be heated in the form of electromagnetic waves. The intensity of emission and its distribution among the different wave-lengths depend upon the nature of the emitting surface and its temperature.

For a given wave-length, λ, the intensity of radiation, $R\gamma$, from a body at a temperature, T°K, is given by the expression:—

$$R\lambda = E\lambda \frac{C_1}{\lambda^5}\left[e^{C_2/\lambda T} - 1\right]^{-1}$$

where C_1 and C_2 are constants and $E\lambda$ the emissivity of the body at the wave-length λ.

$E\lambda$ is numerically equal to $A\lambda$, the absorptivity at the wave-length, λ, which is defined as the fraction of the incident radiation of wave-length, λ, absorbed by the body. $A\lambda$ can never be greater than unity, and hence E_γ cannot be greater than unity. A perfect black body is defined as one for which $E\lambda = A\lambda = 1$ for all values of λ.

By integration of the above equation over all wave-lengths, the total radiant energy emitted at any temperature may be found. This can be expressed in the form of the Stefan-Boltzmann Law:—

$$H = F\sigma T^4,$$

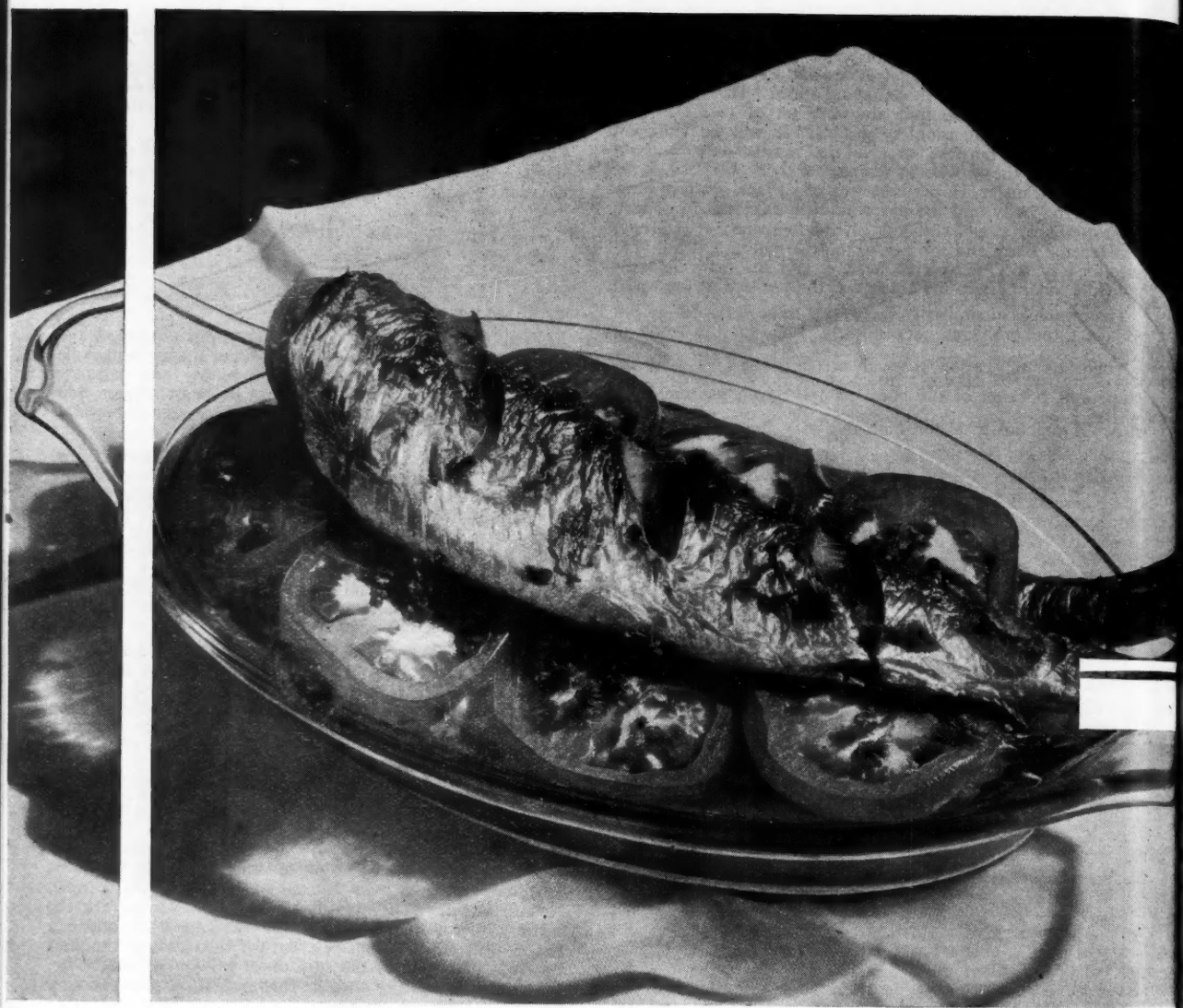
where H is the rate of emission per unit area, E is the total emissivity of the surface under consideration at the temperature T, and σ is a universal constant.

Surfaces the emission of which is similar in distribution to that of a black body, but reduced in intensity in a constant ratio at each wave-length, are defined as grey surfaces. Few substances behave strictly as either black bodies or grey bodies, the emission often varying by different amounts from black-body emission at different wave-lengths. Such substances are called selective radiators.

Non-luminous flames afford a good example of selective radiators. It has been shown that almost all the radiation is emitted by carbon dioxide and water molecules. The water molecule emits strongly in a region of 2·4 to 2·8μ and between 5 and 8·5μ. Carbon dioxide emits in two short regions round about 2·5 and 4·4μ and also at wave-lengths between 12·5 and 16·5μ. The intensity of radiation varies with the thickness of the emitting layer, and G. Schack has given a series of calculated curves relating the heat radiated in unit time from unit area of the surface of a layer of gas to the product of the pressure and the thickness for a series of temperatures. These curves seem to show good agreement with experimental results.

Determination of the Rate of Energy Transfer

If a solid be totally immersed in a flame it will attain an equilibrium temperature at which the heat input from the flame balances the heat lost from the solid by radiation and conduction. Thus, if it be so arranged that conduction may be neglected, the rate of heat-loss by radiation from the solid will be equal to the rate of heat transfer from the flame gases. Preliminary experiments showed that with flat slabs of solid and ordinary cylindrical burners, very uneven heating was obtained, which made the results difficult to interpret. The best experimental arrangement was a rectangular-slit burner with a rod or tube of the solid supported above it, and this had the added advantage that the problem of forced convection from a stream of gas flowing at right-angles to the axis of a rod has received quite a lot of attention. Even with this arrangement, however, irregularity of surface temperature could not be overcome, the lower surface of the tube or rod being hotter, as might be expected. In order to make the effect of conduction negligible, the radiation from a short length of the tube in the centre of the flame was measured, and because of the uneven temperature of the surface it was necessary to determine the radiation at various points around the surface of a cylinder, with the tube as axis, and integrate the readings over the complete surface of such a cylinder.



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Experimental Method

The burner was constructed out of brass, in the form of a rectangular tube 15 cm. long, with internal dimensions 5 × 0·4 cm. This length of tube was found necessary in order to obtain conditions of streamlined flow. The gas and air were passed at constant inlet pressure through calibrated flow-gauges, and were pre-mixed before introduction into the burner.

The apparatus for measuring the intensity of radiation from a sample of solid in the flame is shown diagrammatically in Fig. 2.

The tube of solid was held in position above the burner by means of adjustable wire supports, and the thermopile and screens could be rotated about the axis of the tube by the arrangement indicated. The thermopile was connected to a mirror galvanometer, and readings were taken with the aid of a lamp and scale.

Some trouble was encountered in obtaining suitable tubes of different materials, so that finally the process of coating sillimanite tubes with thin layers of different inorganic compounds had to be resorted to. Sillimanite tubes, 3 in. long and $\frac{1}{8}$ in. outside diameter, with a bore $\frac{1}{16}$ in. diameter, were obtained commercially, and were coated by painting-on thin layers of a paste of the finely ground compound and water until the total thickness of the layer was about $\frac{1}{64}$ in.

The size of the slits in the thermopile screens was adjusted so that radiation from the full diameter of the tube over the central $\frac{1}{2}$-in. length could be measured, and corrections were made for the radiation from the flame itself.

The measurement of the temperature of the solid presented some difficulty since, obviously, an optical pyrometer could not be used because of the different emissivities of the coatings. An indication of the mean temperature of the tube was obtained, however, by means of a thin platinum–platinum 10% rhodium thermocouple threaded through it so that the junction was at the centre. A little consideration will show the validity of this method in the case of a tube at constant temperature, since the thermal junction is surrounded by the equivalent of a blackbody enclosure.

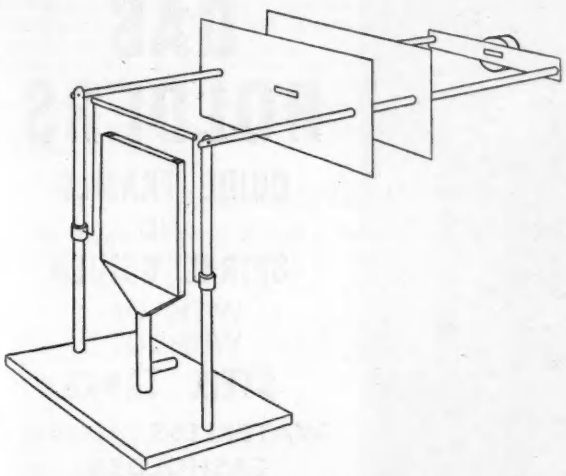

FIG. 2.—*Apparatus for Measuring the Intensity of Radiation from a Tube Immersed in the Flame.*

Preliminary Results

Most of the experiments done so far have been with a carbon monoxide–air flame. It was thought that this might give interesting results because of the activated carbon dioxide molecules which have been postulated by Gaydon.[4]

Among a large number of substances examined were uranium oxide, copper oxide, cobalt oxide, nickel oxide, rouge, alumina, magnesium oxide, china clay, and carborundum of different degrees of coarseness.

In a flame of theoretical carbon monoxide-air composition with flow velocity 135 c.c. per sec., uranium oxide and rouge reached a temperature of about 850°C., whilst alumina and magnesium oxide attained 1,200°C. at the same position in the flame. In spite of this, the radiation from the latter substances was less than that from the former. This seems to be in agreement with what is to be expected on a basis of heat transfer by forced convection, since the hotter the solid the smaller is the temperature difference between it and the flame gases: therefore, the smaller will be the rate of energy transfer.

If we assume that all the energy is transferred by forced convection, the rate is given by $h_cA\ (T_g-T_s)$, where h_c is the convectional heat transfer coefficient, $\frac{H}{\theta}$, which can be determined by the method given in Section II, A is the surface of the solid, and T_g and T_s are the temperatures of the gas and solid respectively. The rate of heat loss by radiation from the solid is given by $EA\sigma T_s^4$, where E is the emissivity of the solid at the absolute temperature T_s. At equilibrium these two rates will be equal, *i.e.*,

$$h_cA(T_g-T_s)=EA\sigma T_s^4.$$

Examination of this equation shows that if T_s be increased, while h_c, A and T_g are maintained constant, the rate of energy input is decreased; therefore, the rate of energy loss by radiation must be decreased. This can only be accomplished by a diminution of the emissivity, E, since T_s is increased and A and σ are constant. In other words, high temperature at the surface of the solid can only be attained by having a surface of low emissivity.

In order to illustrate the kind of decrease in emissivity to be expected, the examples of uranium oxide and alumina will be taken. T_g for a position 1·4 cm. above the burner was found to be about 1,950°C. for the flame in question, by the method given in Section V.

Thus, for uranium oxide at 850°C.—

$$h_cA(2223-1123) = E_1A\sigma 1123^4,$$

and for alumina—

$$h_cA(2223-1473) = E_1A\sigma 1473^4.$$

Since the position and the size of the tubes were identical, h and A were the same in each case; therefore, taking a ratio:—

$$\frac{(2223-1123)}{(2223-1473)} = \frac{E_1}{E_2}\cdot\frac{1123^4}{1473^4}$$

$$\therefore \frac{E_2}{E_1} = \frac{750}{1100}\cdot\frac{1123^4}{1473^4}$$

$$= 0{\cdot}23$$

Uranium oxide is generally accepted as being almost a black body, *i.e.*, its emissivity, E_1, is nearly unity; hence the emissivity, E_2, of alumina at 1,200°C. comes out at about 0·23.

This figure appears to be quite reasonable by comparison with the little data on the emissivities of refractories which have been published.

An interesting result was obtained with carborundum, the coarse grade radiating more than the fine grade, although the temperatures were almost identical. In this case there are two factors involved, both the emissivity and the forced convection heat transfer co-efficient increasing with the coarseness of the surface.

No quantitative results for the radiation can be given until the thermopile has been calibrated, but when these results become available they should be capable of yielding data on the emissivities of the various surface coatings, besides giving a check on the assumption of total heat transfer by forced convection.

Flame-Temperature Measurement

It has sometimes been stated that a flame cannot have a temperature in the strict sense of the word, because it is not a system in equilibrium. Chemical reactions are taking place, part of the energy may be radiated by chemiluminescence and a certain time taken for the transformation of the remaining energy into kinetic energy of the products. Maxwell conceived the temperature of a body as "its thermal state considered with reference to its power of communicating heat to other bodies." If this criterion be adopted, a thermocouple inserted in the flame may be employed as the other body.

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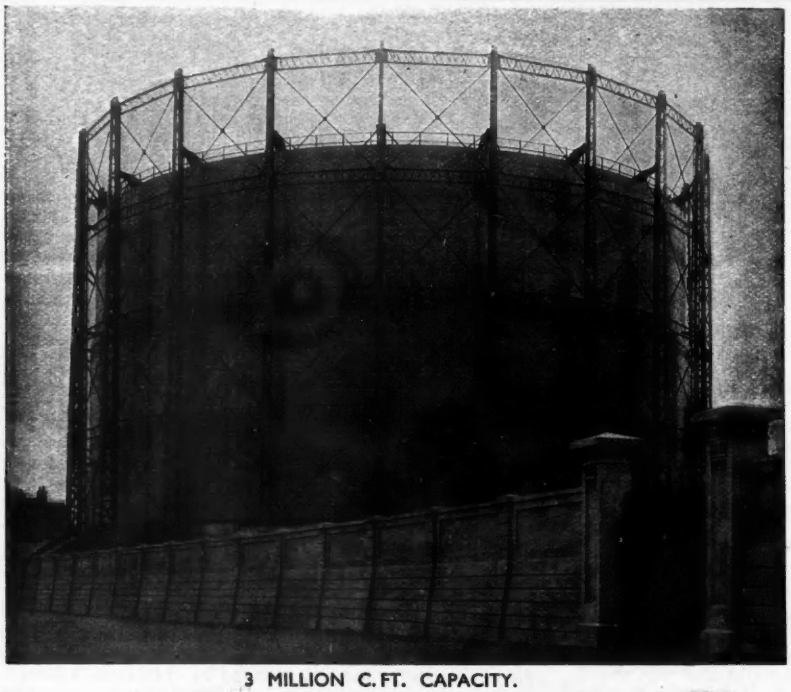

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This method has, in fact, been used, but the results obtained vary with the size of the thermocouple and in any case have to be corrected for heat loss by radiation. Methods using thermocouples or resistance wires are also limited to temperatures below 1,800°C., and the wires are easily contaminated by the flame, leading to erroneous results. Another serious objection is the possibility of catalytic action with attendant abnormal temperatures. The sodium line-reversal method first used by Kurlbaum[7] seems to be the most free from theoretical objections, and the experimental manipulations involved are reasonably simple. This method was, therefore, adopted for flame-temperature measurements.

Theory of the Method of Line Reversal

For a thermal radiator of any kind and for any wave-length, the relation between emissivity and absorptivity is given by Kirchoff's Law:—

$$\frac{R_{\lambda\,(n.b.)}}{R_{\lambda\,(b.)}} = E_\lambda = A_\lambda,$$

where $R_{\lambda(n.b.)}$ is the intensity of radiation from a non-black body, $R_{\lambda\,(b.)}$ is that from a black body, and E_λ and A_λ are the emissivity and absorptivity respectively. A flame may be coloured by the introduction of a sodium salt which vaporizes and dissociates into sodium atoms and other products. The solium atoms are capable of excitation and emit the yellow sodium D-doublet $\lambda = 0.5890 - 6\mu$. If a black body be placed behind the flame, and a spectroscope sighted through the flame on to the black body, there will be some temperature of the latter where its brightness in the spectral region of the D lines is equal to the brightness of the light transmitted in this region through the flame plus the brightness of the D lines from the flame itself. Thus if no light be reflected from the flame the following relation must hold:—

$$R_{D(f.)} + R_{D(b.)}\,(1 - A_{D(f.)}) = R_{D)b.)},$$

where D represents the wave-length of the D lines and f refers to the flame, therefore—

$$R_{D(f.)} = A_{D(f.)}\,R_{D(b.)}.$$

At this temperature only a continuous spectrum will be visible in the spectroscope, while if the black body be at a higher temperature the D lines will appear dark against the continuous background. Similarly, if the black body be at a lower temperature the D lines will appear bright.

Since it has been shown by various investigators that the radiation from flame gases and metal vapours is thermal in character, the temperature of the flame is identical with the reversal temperature.

Experimental Method

The experimental arrangement is shown diagrammatically in Fig. 3. The image of a tungsten filament is focused

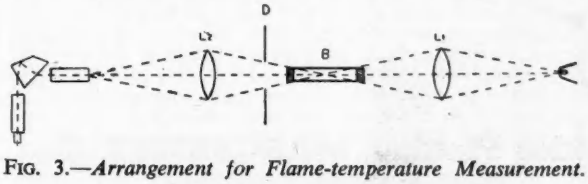


FIG. 3.—*Arrangement for Flame-temperature Measurement.*

on to a portion of the flame above the burner, B, by means of the lens, L_1. The diaphragm, D, defines a composite beam of light, from the flame and the tungsten filament, which is brought to a focus on the slit of the spectroscope by the lens, L_2.

Several methods of introducing salt into the flame have been used. Kohn placed a small piece of salt on the nickel grid of a burner, thus colouring a narrow zone of flame. Griffiths and Awbery used a spray of salt solution carried by the inflammable mixture. Other methods include the passage of an electric arc or spark through salt, or by forming a spark between the electrodes of compressed salt containing a fine wire in the centre. For the purpose of the present investigation it was undesirable to introduce moisture into the flame since dry gases were being used in some of the experiments. A simple method of introducing a fine dust of solid sodium chloride was therefore developed.

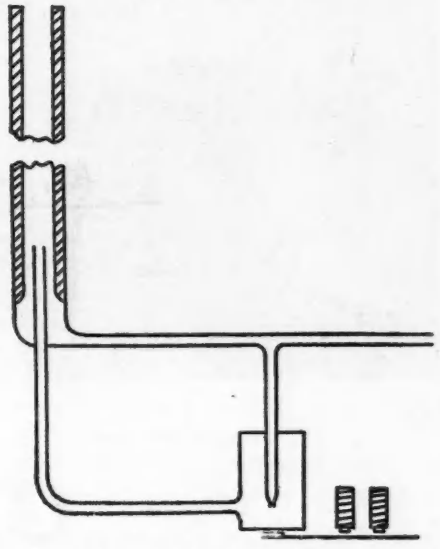


FIG. 4.—*Method of Introducing Salt Into the Flame.*

The apparatus is illustrated in Fig. 4. Part of the gas mixture is passed through a metal container in which very finely ground dry sodium chloride can be agitated by means of an electric-bell armature tapping against the bottom of the vessel. The gas carries with it a fine dust of salt and is introduced into the burner through a centrally placed tube. This ensures that only the central part of the flame is coloured and there will be no interference by the outer sheath.

The proportion of the total gas stream which flows through this salt container can be adjusted by means of a screw clip on rubber tubing in order to maintain conditions of streamline flow. The agitator is only used intermittently just before a reading is to be taken, since if too much salt is introduced into the flame it will obviously lower its temperature.

The tungsten filament was calibrated to give a relation between its temperature and the current passed. To avoid having to make a correction for reflection from the surface of the lens, L_1, the filament was calibrated through this lens. This was achieved by removing the front lens of the optical pyrometer, and bringing the tungsten filament to a focus on the pyrometer filament by means of the lens, L_1. The current passing through the filament was varied with a rheostat, and readings of this current against the temperature indicated by the pyrometer were taken. The optical pyrometer gave the brightness temperature for red light ($\lambda = 0.665\mu$), and this had to be corrected to give the brightness temperature at the wave-length of the sodium D-lines ($\lambda = 0.589\mu$).

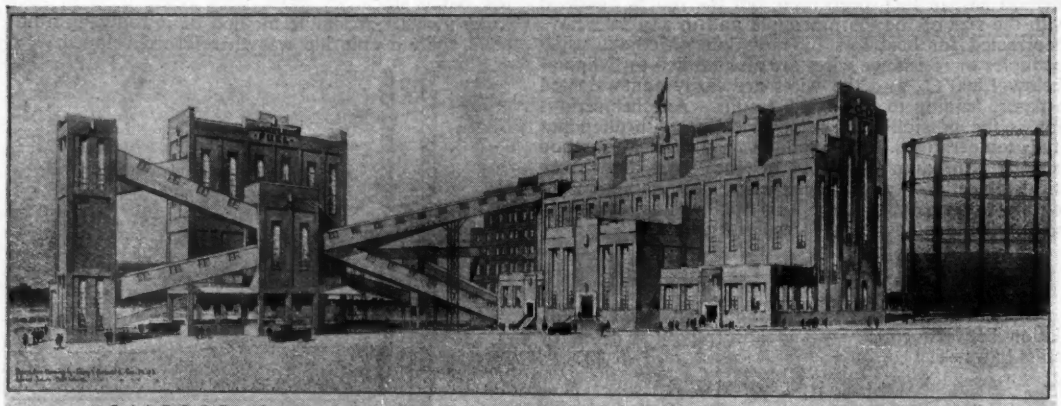
The relationship between these temperatures is given by the following equation:—

$$\frac{1}{T\lambda^1} = \frac{2.303}{C_2}\left[\lambda \log E_\lambda - \lambda^1 \log E_{\lambda^1}\right] + \frac{1}{T_\lambda},$$

where $\lambda = 0{\cdot}0000665$ cm., $\lambda^1 = 0{\cdot}0000589$ cm., E_λ = emissivity in the red, E_{λ^1} = emissivity in the yellow T_λ is the brightness temperature given by the pyrometer (°K), and T_{λ^1} the brightness temperature at the wave-length of the sodium D-lines.

Data for the emissivity of tungsten at various wave-lengths and various temperatures was taken from Forsythe and Worthing,[8] and this enabled the following correction chart to be calculated:—

True temperature (°K.)	Pyrometer temperature T.665μ	T.589μ	E.665μ	E.589μ
1,900	1,771	1,789	0·437	0·450
2,100	1,943	1,965	0·433	0·446
2,200	2,026	2,049	0·431	0·444
2,400	2,192	2,220	0·427	0·441
2,500	2,274	2,304	0·425	0·439



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Thus from a curve of $T._{665}\mu$ against $T._{550}\mu$, the corrected temperature could be ascertained. The calibration curve for the tungsten filament is given in Fig. 5

In order to facilitate measurement of temperature at various positions in the flame, the burner was mounted on a movable stage, and its position in the vertical and horizontal directions could be read off by means of vernier attachments.

An example of the results obtained is given in Fig. 6.

The lower curve refers to a flame of 40% carbon monoxide in air with a flow speed of 100 c.c. per sec. This is a gas-rich mixture, so that the temperature distribution is modified by combustion with secondary air. The other curves are for mixtures on each side of the theoretical (29·6%), maintaining the rate of flow of carbon monoxide at 40 c.c. per sec., and altering the rate of flow of air. In the case of the 25% mixture it will be seen that a maximum temperature is attained at a short distance above the cone, and the temperature then drops rapidly because of the cooling influence of the excess air.

The effect of introducing solid materials into the flame is also being investigated.

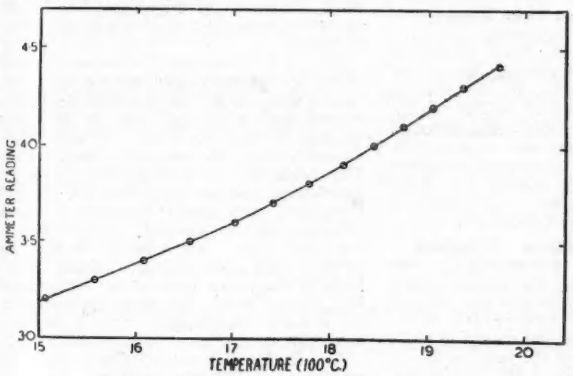

FIG. 5.—*Tungsten Filament Calibration.*

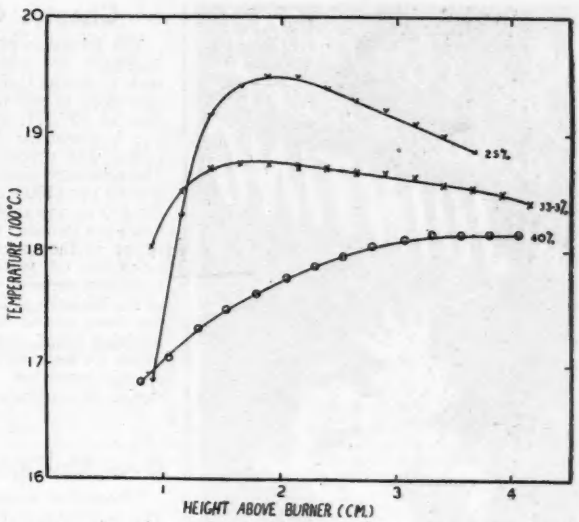

FIG. 6.—*Effect of Mixture Composition on Flame Temperatures.*

Appendix

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Progress in the Hydrogenation of Coal and Tar*

By KENNETH GORDON, G.B.E., M.C.
Joint Managing Director, Bellingham Division, I.C.I.

A "GAS JOURNAL" Abstract.

THE Author traces the development of hydrogenation at Billingham since his Paper of November, 1935. The Billingham plant was originally designed to make 100,000 tons a year of petrol by the hydrogenation of Durham coal. Before the erection of the plant was complete the manufacture of 42,000 tons a year of petrol from creosote was added, this process being originally intended for starting the vapour-phase section of the coal hydrogenation plant. The creosote process became so promising that purchases were increased in 1936 to raise petrol production from creosote to 75,000 tons a year. The practical difficulties in the hydrogenation of coal were gradually overcome and from the end of 1936 to the outbreak of war, the process worked without mechanical trouble. The reliability of coal hydrogenation is indicated by the fact that the average uninterrupted run in the years 1937 to 1939 was 2½ months with a maximum of seven months. Increases in the price of coal, however, made the process economically unattractive. Creosote continued to be treated and in much greater quantities than originally anticipated, rising to a production of 148,000 tons of petrol in 1940. The petrol was made to specifications laid down by the marketing companies commercial grade No. I premium and 87 octance aviation fuel pre-war and during the war, pool petrol, 87 octance aviation and base spirit for 100 octance fuel.

In 1939 the plant was re-arranged to make 180,000 tons from creosote, reducing coal hydrogenation to produce 20,000 tons of petrol a year. This gave an overall increase in total output and left coal hydrogenation working on a sufficiently large scale for continued study, but at the outbreak of war it was decided that coal treatment would be difficult, if not impossible, if there were frequent air-raids, and it was discontinued. Creosote treatment continued throughout the war.

The total output of aviation spirit, in conjunction with the oil hydrogenation plant at Heysham and the Shell Company's iso-octane plant at Stanlow, was 500,000 tons a year, to which Billingham contributed nearly a quarter. Among other developments was the addition of a propane recovery plant in March, 1940—this gas being used as an alternative to acetylene for metal cutting.

In Germany the total maximum annual output achieved was 3,682,000 tons a year in twelve plants using raw materials bituminous and brown coal, and pitch and tar derived from them, with some petroleum residues. The feature of development was the use of higher pressures, up to 700 atmospheres, avoiding "the rather complicated catalytic conditions which are necessary—at pressures in the range of 200 to 300 atmospheres." "The striking thing about the German developments was not their quality but their quantity."

The Paper describes with beautifully drawn diagrams methods used in the methane-steam plant, coal hydrogenation, liquid-phase hydrogenation of heavy oil, vapour-phase hydrogenation stalls, iso-octane plant, victane manufacture and other processes, "victane" being the name given to butyl benzene, the production of which was developed in 1943 to satisfy the demand for rich mixture components.

*Paper to the Institute of Fuel